PHILIPS

Data handbook

Electronic components and materials

Semiconductors

Part 10 July 1983

Wideband transistors and Wideband hybrid IC modules

SEMICONDUCTORS

PART 10 - JULY 1983

WIDEBAND TRANSISTORS AND WIDEBAND HYBRID IC MODULES

DATA HANDBOOK SYSTEM
SEMICONDUCTOR INDEX

GENERAL

WIDEBAND TRANSISTORS

HYBRID IC MODULES:

CATV AMPLIFIER MODULES (V.H.F.)

WIDEBAND AMPLIFIERS (V.H.F. & U.H.F.)

DATA HANDBOOK SYSTEM

Our Data Handbook System is a comprehensive source of information on electronic components, sub-assemblies and materials; it is made up of four series of handbooks each comprising several parts.

ELECTRON TUBES	BLUE
SEMICONDUCTORS	RED
INTEGRATED CIRCUITS	PURPLE
COMPONENTS AND MATERIALS	GREEN

The several parts contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where ratings or specifications differ from those published in the preceding edition they are pointed out by arrows. Where application information is given it is advisory and does not form part of the product specification.

If you need confirmation that the published data about any of our products are the latest available, please contact our representative. He is at your service and will be glad to answer your inquiries.

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May 1980

ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks is comprised of the following parts:

T1 Tubes for r.f. heating

T2 Transmitting tubes for communications

T3 Klystrons, travelling-wave tubes, microwave diodes

ET3 Special Quality tubes, miscellaneous devices (will not be reprinted)

T4 Magnetrons

T5 Cathode-ray tubes
Instrument tubes, monitor and display tubes, C.R. tubes for special applications

T6 Geiger-Muller tubes

T7 Gas-filled tubes
Segment indicator tubes, indicator tubes, dry reed contact units, thyratrons, industrial rectifying tubes, ignitrons, high-voltage rectifying tubes, associated accessories

T8 Picture tubes and components
Colour TV picture tubes, black and white TV picture tubes, colour monitor tubes for data graphic display, monochrome monitor tubes for data graphic display, components for colour television, components for black and white television and monochrome data graphic display

T9 Photo and electron multipliers
Photomultiplier tubes, phototubes, single channel electron multipliers, channel electron multiplier plates

T10 Camera tubes and accessories, image intensifiers

T11 Microwave semiconductors and components

SEMICONDUCTORS (RED SERIES)

The red series of data handbooks is comprised of the following parts:

S1 **Diodes**
Small-signal germanium diodes, small-signal silicon diodes, voltage regulator diodes(< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes

S2 **Power diodes, thyristors, triacs**
Rectifier diodes, voltage regulator diodes (> 1,5 W), rectifier stacks, thyristors, triacs

S3 **Small-signal transistors**

S4 **Low-frequency power transistors and hybrid IC modules**

S5 **Field-effect transistors**

S6 **R.F. power transistors and modules**

S7 **Microminiature semiconductors for hybrid circuits**

S8 **Devices for optoelectronics**
Photosensitive diodes and transistors, light-emitting diodes, displays, photocouplers, infrared sensitive devices, photoconductive devices.

S9 Taken into handbook T11 of the blue series

S10 **Wideband transistors and wideband hybrid IC modules**

January 1982

INTEGRATED CIRCUITS (PURPLE SERIES)

The purple series of data handbooks is comprised of the following parts:

IC1 Bipolar ICs for radio and audio equipment

IC2 Bipolar ICs for video equipment

IC3 ICs for digital systems in radio, audio and video equipment

IC4 Digital integrated circuits
CMOS HE4000B family

IC5 Digital integrated circuits – ECL
ECL10 000 (GX family), ECL100 000 (HX family), dedicated designs

IC6 Professional analogue integrated circuits

IC7 Signetics bipolar memories

IC8 Signetics analogue circuits

IC9 Signetics TTL logic

IC10 Signetics Integrated Fuse Logic (IFL)

IC11 Microprocessors, microcomputers and peripheral circuitry

COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks is comprised of the following parts:

C1 **Assemblies for industrial use**
PLC modules, PC20 modules, HNIL FZ/30 series, NORbits 60-, 61-, 90-series, input devices, hybrid ICs

C2 **Television tuners, video modulators, surface acoustic wave filters**

C3 **Loudspeakers**

C4 **Ferroxcube potcores, square cores and cross cores**

C5 **Ferroxcube for power, audio/video and accelerators**

C6 **Electric motors and accessories**
Permanent magnet synchronous motors, stepping motors, direct current motors

C7 **Variable capacitors**

C8 **Variable mains transformers**

C9 **Piezoelectric quartz devices**
Quartz crystal units, temperature compensated crystal oscillators, compact integrated oscillators, quartz crystal cuts for temperature measurements

C10 **Connectors**

C11 **Non-linear resistors**
Voltage dependent resistors (VDR), light dependent resistors (LDR), negative temperature coefficient thermistors (NTC), positive temperature coefficient thermistors (PTC)

C12 **Variable resistors and test switches**

C13 **Fixed resistors**

C14 **Electrolytic and solid capacitors**

C15 **Film capacitors, ceramic capacitors**

C16 **Piezoelectric ceramics, permanent magnet materials**

SEMICONDUCTOR INDEX

INDEX OF TYPE NUMBERS

Data Handbooks S1 to S10

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	book	section	type no.	book	section	type no.	book	section
AA119	S1	GD	BAS19	S7/S1	Mm/SD	BB109G	S1	T
AAZ15	S1	GD	BAS20	S7/S1	Mm/SD	BB112	S1	T
AAZ17	S1	GD	BAS21	S7/S1	Mm/SD	BB119	S1	T
AAZ18	S1	GD	BAT17	S7/S1	Mm/T	BB130	S1	T
BA220	S1	SD	BAT18	S7/S1	Mm/T	BB204B	S1	T
BA221	S1	SD	BAT81	S1	T	BB204G	S1	T
BA223	S1	T	BAT82	S1	T	BB212	S1	T
BA243	S1	T	BAT83	S1	T	BB405B	S1	T
BA244	S1	T	BAT85	S1	T	BB405G	S1	T
BA280	S1	T	BAV10	S1	SD	BB417	S1	T
BA314	S1	Vrg	BAV18	S1	SD	BB809	S1	T
BA315	S1	Vrg	BAV19	S1	SD	BB909A	S1	T
BA316	S1	SD	BAV20	S1	SD	BB909B	S1	T
BA317	S1	SD	BAV21	S1	SD	BBY31	S7/S1	Mm/T
BA318	S1	SD	BAV45	S1	Sp	BBY40	S7/S1	Mm/T
BA379	S1	T	BAV70	S7/S1	Mm/SD	BC107	S3	Sm
BA423	S1	T	BAV99	S7/S1	Mm/SD	BC108	S3	Sm
BA481	S1	T	BAW56	S7/S1	Mm/SD	BC109	S3	Sm
BA482	S1	T	BAW62	S1	SD	BC146	S3	Sm
BA483	S1	T	BAX12	S1	SD	BC177	S3	Sm
BA484	S1	T	BAX12A	S1	SD	BC178	S3	Sm
BAS11	S1	SD	BAX14	S1	SD	BC179	S3	Sm
BAS16	S7/S1	Mm/SD	BAX18	S1	SD	BC200	S3	Sm
BAS17	S7/S1	Mm/Vrg	BB105B	S1	T	BC264A	S5	FET
BAS18	S1	SD	BB105G	S1	T	BC264B	S5	FET

FET = Field-effect transistors
GD = Germanium diodes
Mm = Microminiature semiconductors for hybrid circuits
SD = Small-signal diodes
Sm = Small-signal transistors
Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes

type no.	book	section	type no.	book	section	type no.	book	section
BC264C	S5	FET	BC868	S7	Mm	BCY71	S3	Sm
BC264D	S5	FET	BC869	S7	Mm	BCY72	S3	Sm
BC327;A	S3	Sm	BCF29;R	S7	Mm	BCY78	S3	Sm
BC328	S3	Sm	BCF30;R	S7	Mm	BCY79	S3	Sm
BC337;A	S3	Sm	BCF32;R	S7	Mm	BCY87	S3	Sm
BC338	S3	Sm	BCF33;R	S7	Mm	BCY88	S3	Sm
BC368	S3	Sm	BCF70;R	S7	Mm	BCY89	S3	Sm
BC369	S3	Sm	BCF81;R	S7	Mm	BD131	S4	P
BC375	S3	Sm	BCV71;R	S7	Mm	BD132	S4	P
BC376	S3	Sm	BCV72;R	S7	Mm	BD135	S4	P
BC546	S3	Sm	BCW29;R	S7	Mm	BD136	S4	P
BC547	S3	Sm	BCW30;R	S7	Mm	BD137	S4	P
BC548	S3	Sm	BCW31;R	S7	Mm	BD138	S4	P
BC549	S3	Sm	BCW32;R	S7	Mm	BD139	S4	P
BC550	S3	Sm	BCW33;R	S7	Mm	BD140	S4	P
BC556	S3	Sm	BCW60*	S7	Mm	BD201	S4	P
BC557	S3	Sm	BCW61*	S7	Mm	BD202	S4	P
BC558	S3	Sm	BCW69;R	S7	Mm	BD203	S4	P
BC559	S3	Sm	BCW70;R	S7	Mm	BD204	S4	P
BC560	S3	Sm	BCW71;R	S7	Mm	BD226	S4	P
BC635	S3	Sm	BCW72;R	S7	Mm	BD227	S4	P
BC636	S3	Sm	BCW81;R	S7	Mm	BD228	S4	P
BC637	S3	Sm	BCW89;R	S7	Mm	BD229	S4	P
BC638	S3	Sm	BCX17;R	S7	Mm	BD230	S4	P
BC639	S3	Sm	BCX18;R	S7	Mm	BD231	S4	P
BC640	S3	Sm	BCX19;R	S7	Mm	BD233	S4	P
BC807	S7	Mm	BCX20;R	S7	Mm	BD234	S4	P
BC808	S7	Mm	BCX51	S7	Mm	BD235	S4	P
BC817	S7	Mm	BCX52	S7	Mm	BD236	S4	P
BC818	S7	Mm	BCX53	S7	Mm	BD237	S4	P
BC846	S7	Mm	BCX54	S7	Mm	BD238	S4	P
BC847	S7	Mm	BCX55	S7	Mm	BD291	S4	P
BC848	S7	Mm	BCX56	S7	Mm	BD292	S4	P
BC849	S7	Mm	BCX70*	S7	Mm	BD293	S4	P
BC850	S7	Mm	BCX71*	S7	Mm	BD294	S4	P
BC856	S7	Mm	BCY56	S3	Sm	BD295	S4	P
BC857	S7	Mm	BCY57	S3	Sm	BD296	S4	P
BC858	S7	Mm	BCY58	S3	Sm	BD329	S4	P
BC859	S7	Mm	BCY59	S3	Sm	BD330	S4	P
BC860	S7	Mm	BCY70	S3	Sm	BD331	S4	P

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors

type no.	book	section	type no.	book	section	type no.	book	section
BD332	S4	P	BD828	S4	P	BDT30C	S4	P
BD333	S4	P	BD829	S4	P	BDT31	S4	P
BD334	S4	P	BD830	S4	P	BDT31A	S4	P
BD335	S4	P	BD839	S4	P	BDT31B	S4	P
BD336	S4	P	BD840	S4	P	BDT31C	S4	P
BD337	S4	P	BD841	S4	P	BDT32	S4	P
BD338	S4	P	BD842	S4	P	BDT32A	S4	P
BD433	S4	P	BD843	S4	P	BDT32B	S4	P
BD434	S4	P	BD844	S4	P	BDT32C	S4	P
BD435	S4	P	BD933	S4	P	BDT41	S4	P
BD436	S4	P	BD934	S4	P	BDT41A	S4	P
BD437	S4	P	BD935	S4	P	BDT41B	S4	P
BD438	S4	P	BD936	S4	P	BDT41C	S4	P
BD645	S4	P	BD937	S4	P	BDT42	S4	P
BD646	S4	P	BD938	S4	P	BDT42A	S4	P
BD647	S4	P	BD939	S4	P	BDT42B	S4	P
BD648	S4	P	BD940	S4	P	BDT42C	S4	P
BD649	S4	P	BD941	S4	P	BDT60	S4	P
BD650	S4	P	BD942	S4	P	BDT60A	S4	P
BD651	S4	P	BD943	S4	P	BDT60B	S4	P
BD652	S4	P	BD944	S4	P	BDT60C	S4	P
BD675	S4	P	BD945	S4	P	BDT61	S4	P
BD676	S4	P	BD946	S4	P	BDT61A	S4	P
BD677	S4	P	BD947	S4	P	BDT61B	S4	P
BD678	S4	P	BD948	S4	P	BDT61C	S4	P
BD679	S4	P	BD949	S4	P	BDT62	S4	P
BD680	S4	P	BD950	S4	P	BDT62A	S4	P
BD681	S4	P	BD951	S4	P	BDT62B	S4	P
BD682	S4	P	BD952	S4	P	BDT62C	S4	P
BD683	S4	P	BD953	S4	P	BDT63	S4	P
BD684	S4	P	BD954	S4	P	BDT63A	S4	P
BD813	S4	P	BD955	S4	P	BDT63B	S4	P
BD814	S4	P	BD956	S4	P	BDT63C	S4	P
BD815	S4	P	BDT29	S4	P	BDT64	S4	P
BD816	S4	P	BDT29A	S4	P	BDT64A	S4	P
BD817	S4	P	BDT29B	S4	P	BDT64B	S4	P
BD818	S4	P	BDT29C	S4	P	BDT64C	S4	P
BD825	S4	P	BDT30	S4	P	BDT65	S4	P
BD826	S4	P	BDT30A	S4	P	BDT65A	S4	P
BD827	S4	P	BDT30B	S4	P	BDT65B	S4	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDT65C	S4	P	BDX63	S4	P	BF241	S3	Sm
BDT91	S4	P	BDX63A	S4	P	BF245A	S5	FET
BDT92	S4	P	BDX63B	S4	P	BF245B	S5	FET
BDT93	S4	P	BDX63C	S4	P	BF245C	S5	FET
BDT94	S4	P	BDX64	S4	P	BF246A	S5	FET
BDT95	S4	P	BDX64A	S4	P	BF246B	S5	FET
BDT96	S4	P	BDX64B	S4	P	BF246C	S5	FET
BDV64	S4	P	BDX64C	S4	P	BF256A	S5	FET
BDV64A	S4	P	BDX65	S4	P	BF256B	S5	FET
BDV64B	S4	P	BDX65A	S4	P	BF256C	S5	FET
BDV64C	S4	P	BDX65B	S4	P	BF324	S3	Sm
BDV65	S4	P	BDX65C	S4	P	BF370	S3	Sm
BDV65A	S4	P	BDX66	S4	P	BF410A	S5	FET
BDV65B	S4	P	BDX66A	S4	P	BF410B	S5	FET
BDV65C	S4	P	BDX66B	S4	P	BF410C	S5	FET
BDV91	S4	P	BDX66C	S4	P	BF410D	S5	FET
BDV92	S4	P	BDX67	S4	P	BF419	S4	P
BDV93	S4	P	BDX67A	S4	P	BF422	S3	Sm
BDV94	S4	P	BDX67B	S4	P	BF423	S3	Sm
BDV95	S4	P	BDX67C	S4	P	BF450	S3	Sm
BDV96	S4	P	BDX77	S4	P	BF451	S3	Sm
BDW55	S4	P	BDX78	S4	P	BF457	S4	P
BDW56	S4	P	BDX91	S4	P	BF458	S4	P
BDW57	S4	P	BDX92	S4	P	BF459	S4	P
BDW58	S4	P	BDX93	S4	P	BF469	S4	P
BDW59	S4	P	BDX94	S4	P	BF470	S4	P
BDW60	S4	P	BDX95	S4	P	BF471	S4	P
BDX35	S4	P	BDX96	S4	P	BF472	S4	P
BDX36	S4	P	BDY90	S4	P	BF480	S3	Sm
BDX37	S4	P	BDY90A	S4	P	BF494	S3	Sm
BDX42	S4	P	BDY91	S4	P	BF495	S3	Sm
BDX43	S4	P	BDY92	S4	P	BF496	S3	Sm
BDX44	S4	P	BF180	S3	Sm	BF510	S7	Mm
BDX45	S4	P	BF181	S3	Sm	BF511	S7	Mm
BDX46	S4	P	BF182	S3	Sm	BF512	S7	Mm
BDX47	S4	P	BF183	S3	Sm	BF513	S7	Mm
BDX62	S4	P	BF198	S3	Sm	BF536	S7	Mm
BDX62A	S4	P	BF199	S3	Sm	BF550;R	S7	Mm
BDX62B	S4	P	BF200	S3	Sm	BF569	S7	Mm
BDX62C	S4	P	BF240	S3	Sm	BF579	S7	Mm

FET = Field-effect transistors
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type no.	book	section	type no.	book	section	type no.	book	section
BF620	S7	Mm	BFP90A	S10	WBT	BFR90A	S10	WBT
BF621	S7	Mm	BFP91A	S10	WBT	BFR91	S10	WBT
BF622	S7	Mm	BFP96	S10	WBT	BFR91A	S10	WBT
BF623	S7	Mm	BFQ10	S5	FET	BFR92;R	S7	Mm
BF660;R	S7	Mm	BFQ11	S5	FET	BFR92A;R	S7	Mm
BF689K	S10	WBT	BFQ12	S5	FET	BFR93;R	S7	Mm
BF767	S7	Mm	BFQ13	S5	FET	BFR93A;R	S7	Mm
BF819	S4	P	BFQ14	S5	FET	BFR94	S10	WBT
BF820	S7	Mm	BFQ15	S5	FET	BFR95	S10	WBT
BF821	S7	Mm	BFQ16	S5	FET	BFR96	S10	WBT
BF822	S7	Mm	BFQ17	S7	Mm	BFR96S	S10	WBT
BF823	S7	Mm	BFQ18A	S7	Mm	BFR101A;B	S7	Mm
BF857	S4	P	BFQ19	S7	Mm	BFS17;R	S7	Mm
BF858	S4	P	BFQ22	S10	WBT	BFS18;R	S7	Mm
BF859	S4	P	BFQ22S	S10	WBT	BFS19;R	S7	Mm
BF869	S4	P	BFQ23	S10	WBT	BFS20;R	S7	Mm
BF870	S4	P	BFQ24	S10	WBT	BFS21	S5	FET
BF871	S4	P	BFQ32	S10	WBT	BFS21A	S5	FET
BF872	S4	P	BFQ33	S10	WBT	BFS22A	S6	RFP
BF926	S3	Sm	BFQ34	S10	WBT	BFS23A	S6	RFP
BF936	S3	Sm	BFQ34T	S10	WBT	BFT24	S10	WBT
BF939	S3	Sm	BFQ42	S6	RFP	BFT25;R	S7	Mm
BF960	S5	FET	BFQ43	S6	RFP	BFT44	S3	Sm
BF964	S5	FET	BFQ51	S10	WBT	BFT45	S3	Sm
BF966	S5	FET	BFQ52	S10	WBT	BFT46	S7	Mm
BF967	S3	Sm	BFQ53	S10	WBT	BFT92;R	S7	Mm
BF970	S3	Sm	BFQ63	S10	WBT	BFT93;R	S7	Mm
BF979	S3	Sm	BFQ65	S10	WBT	BFW10	S5	FET
BF980	S5	FET	BFQ66	S10	WBT	BFW11	S5	FET
BF981	S5	FET	BFQ68	S10	WBT	BFW12	S5	FET
BF982	S5	FET	BFR29	S5	FET	BFW13	S5	FET
BF989	S7	Mm	BFR30	S7	Mm	BFW16A	S10	WBT
BF990	S7	Mm	BFR31	S7	Mm	BFW17A	S10	WBT
BF991	S7	Mm	BFR49	S10	WBT	BFW30	S10	WBT
BF992	S7	Mm	BFR53;R	S7	Mm	BFW61	S5	FET
BF994	S7	Mm	BFR54	S3	Sm	BFW92	S10	WBT
BF996	S7	Mm	BFR64	S10	WBT	BFW92A	S10	WBT
BFG90A	S10	WBT	BFR65	S10	WBT	BFW93	S10	WBT
BFG91A	S10	WBT	BFR84	S5	FET	BFX29	S3	Sm
BFG96	S10	WBT	BFR90	S10	WBT	BFX30	S3	Sm

FET = Field-effect transistors
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RFP = R.F. power transistors and modules
Sm = Small-signal transistors
WBT = Wideband hybrid IC transistors

type no.	book	section	type no.	book	section	type no.	book	section
BFX34	S3	Sm	BGY57	S10	WBM	BLW82	S6	RFP
BFX84	S3	Sm	BGY58	S10	WBM	BLW83	S6	RFP
BFX85	S3	Sm	BGY58A	S10	WBT	BLW84	S6	RFP
BFX86	S3	Sm	BGY59	S10	WBM	BLW85	S6	RFP
BFX87	S3	Sm	BGY60	S10	WBM	BLW86	S6	RFP
BFX88	S3	Sm	BGY61	S10	WBT	BLW87	S6	RFP
BFX89	S10	WBT	BGY65	S10	WBT	BLW89	S6	RFP
BFY50	S3	Sm	BGY67	S10	WBT	BLW90	S6	RFP
BFY51	S3	Sm	BGY70	S10	WBT	BLW91	S6	RFP
BFY52	S3	Sm	BGY71	S10	WBT	BLW95	S6	RFP
BFY55	S3	Sm	BGY74	S10	WBM	BLW96	S6	RFP
BFY90	S10	WBT	BGY75	S10	WBM	BLW98	S6	RFP
BG2000	S1	RT	BLV10	S6	RFP	BLX13	S6	RFP
BG2097	S1	RT	BLV11	S6	RFP	BLX13C	S6	RFP
BGX11*	S2	ThM	BLV20	S6	RFP	BLX14	S6	RFP
BGX12*	S2	ThM	BLV21	S6	RFP	BLX15	S6	RFP
BGX13*	S2	ThM	BLV25	S6	RFP	BLX39	S6	RFP
BGX14*	S2	ThM	BLV30	S6	RFP	BLX65	S6	RFP
BGX15*	S2	ThM	BLV31	S6	RFP	BLX66	S6	RFP
BGX17*	S2	ThM	BLV32F	S6	RFP	BLX67	S6	RFP
BGY22	S6	RFP	BLV33	S6	RFP	BLX68	S6	RFP
BGY22A	S6	RFP	BLV33F	S6	RFP	BLX69A	S6	RFP
BGY23	S6	RFP	BLV36	S6	RFP	BLX91A	S6	RFP
BGY23A	S6	RFP	BLV57	S6	RFP	BLX92A	S6	RFP
BGY32	S6	RFP	BLW29	S6	RFP	BLX93A	S6	RFP
BGY33	S6	RFP	BLW31	S6	RFP	BLX94A	S6	RFP
BGY35	S6	RFP	BLW32	S6	RFP	BLX94C	S6	RFP
BGY36	S6	RFP	BLW33	S6	RFP	BLX95	S6	RFP
BGY40A	S6	RFP	BLW34	S6	RFP	BLX96	S6	RFP
BGY40B	S6	RFP	BLW50F	S6	RFP	BLX97	S6	RFP
BGY41A	S6	RFP	BLW60	S6	RFP	BLX98	S6	RFP
BGY41B	S6	RFP	BLW60C	S6	RFP	BLY33	S6	RFP
BGY43	S6	RFP	BLW64	S6	RFP	BLY34	S6	RFP
BGY50	S10	WBM	BLW75	S6	RFP	BLY35	S6	RFP
BGY51	S10	WBM	BLW76	S6	RFP	BLY36	S6	RFP
BGY52	S10	WBM	BLW77	S6	RFP	BLY83	S6	RFP
BGY53	S10	WBM	BLW78	S6	RFP	BLY84	S6	RFP
BGY54	S10	WBM	BLW79	S6	RFP	BLY85	S6	RFP
BGY55	S10	WBM	BLW80	S6	RFP	BLY87A	S6	RFP
BGY56	S10	WBM	BLW81	S6	RFP	BLY87C	S6	RFP

RFP = R.F. power transistors and modules
RT = Tripler
Sm = Small-signal transistors
ThM = Thyristor Modules
WBM = Wideband hybrid IC modules
WBT = Wideband hybrid IC transistors

type no.	book	section	type no.	book	section	type no.	book	section
BLY88A	S6	RFP	BSR17;R	S7	Mm	BSV16	S3	Sm
BLY88C	S6	RFP	BSR17A;R	S7	Mm	BSV17	S3	Sm
BLY89A	S6	RFP	BSR18;R	S7	Mm	BSV52;R	S7	Mm
BLY89C	S6	RFP	BSR18A;R	S7	Mm	BSV64	S3	Sm
BLY90	S6	RFP	BSR30	S7	Mm	BSV78	S5	FET
BLY91A	S6	RFP	BSR31	S7	Mm	BSV79	S5	FET
BLY91C	S6	RFP	BSR32	S7	Mm	BSV80	S5	FET
BLY92A	S6	RFP	BSR33	S7	Mm	BSV81	S5	FET
BLY92C	S6	RFP	BSR40	S7	Mm	BSW66A	S3	Sm
BLY93A	S6	RFP	BSR41	S7	Mm	BSW67A	S3	Sm
BLY93C	S6	RFP	BSR42	S7	Mm	BSW68A	S3	Sm
BLY94	S6	RFP	BSR43	S7	Mm	BSX19	S3	Sm
BLY97	S6	RFP	BSR50	S3	Sm	BSX20	S3	Sm
BPW22A	S8	PDT	BSR51	S3	Sm	BSX45	S3	Sm
BPW44	S8	PDT	BSR52	S3	Sm	BSX46	S3	Sm
BPW45	S8	PDT	BSR56	S7	Mm	BSX47	S3	Sm
BPW50	S8	PDT	BSR57	S7	Mm	BSX59	S3	Sm
BPX25	S8	PDT	BSR58	S7	Mm	BSX60	S3	Sm
BPX29	S8	PDT	BSR60	S3	Sm	BSX61	S3	Sm
BPX40	S8	PDT	BSR61	S3	Sm	BSY95A	S3	Sm
BPX41	S8	PDT	BSR62	S3	Sm	BT136*	S2	Tri
BPX42	S8	PDT	BSS38	S3	Sm	BT137*	S2	Tri
BPX47B/18	S8	PDT	BSS50	S3	Sm	BT138*	S2	Tri
BPX47B/20	S8	PDT	BSS51	S3	Sm	BT139*	S2	Tri
BPX47C/36	S8	PDT	BSS52	S3	Sm	BT149*	S2	Th
BPX70	S8	PDT	BSS60	S3	Sm	BT151*	S2	Th
BPX71	S8	PDT	BSS61	S3	Sm	BT152*	S2	Th
BPX72	S8	PDT	BSS62	S3	Sm	BT153	S2	Th
BPX95C	S8	PDT	BSS63;R	S7	Mm	BT154	S2	Th
BR100/03	S2	Th	BSS64;R	S7	Mm	BT155*	S2	Th
BR101	S3	Sm	BSS68	S3	Sm	BTV24*	S2	Th
BRY39	S3	Sm	BST15	S7	Mm	BTV34*	S2	Tri
BRY56	S3	Sm	BST16	S7	Mm	BTV58*	S2	Th
BRY61	S7	Mm	BST50	S7	Mm	BTW23*	S2	Th
BRY62	S7	Mm	BST51	S7	Mm	BTW30S*	S2	Th
BSR12;R	S7	Mm	BST52	S7	Mm	BTW31W*	S2	Th
BSR13;R	S7	Mm	BST60	S7	Mm	BTW38*	S2	Th
BSR14;R	S7	Mm	BST61	S7	Mm	BTW40*	S2	Th
BSR15;R	S7	Mm	BST62	S7	Mm	BTW42*	S2	Th
BSR16;R	S7	Mm	BSV15	S3	Sm	BTW43*	S2	Tri

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
PDT = Photodiodes or transistors
RFP = R.F. power transistors and modules
Sm = Small-signal transistors
Th = Thyristors
Tri = Triacs

type no.	book	section	type no.	book	section	type no.	book	section
BTW45*	S2	Th	BY224*	S2	R	BYW54	S1	R
BTW47*	S2	Th	BY225*	S2	R	BYW55	S1	R
BTW58*	S2	Th	BY228	S1	R	BYW56	S1	R
BTW63*	S2	Th	BY229*	S2	R	BYW92*	S2	R
BTW92*	S2	Th	BY249	S2	R	BYW93*	S2	R
BTX18*	S2	Th	BY260*	S2	R	BYW94*	S2	R
BTX94*	S2	Tri	BY261*	S2	R	BYW95A	S1	R
BTY79*	S2	Th	BY277*	S2	R	BYW95B	S1	R
BTY87*	S2	Th	BY438	S1	R	BYW95C	S1	R
BTY91*	S2	Th	BY448	S1	R	BYW96D	S1	R
BU208A	S4	P	BY458	S1	R	BYW96E	S1	R
BU326	S4	P	BY476	S1	R	BYX10	S1	R
BU326A	S4	P	BY477	S1	R	BYX22*	S2	R
BU426	S4	P	BY478	S1	R	BYX25*	S2	R
BU426A	S4	P	BY505	S1	R	BYX30*	S2	R
BU433	S4	P	BY509	S1	R	BYX32*	S2	R
BUS11;A	S4	P	BY527	S1	R	BYX38*	S2	R
BUS12;A	S4	P	BY584	S1	R	BYX39*	S2	R
BUS13;A	S4	P	BY609	S1	R	BYX42*	S2	R
BUS14;A	S4	P	BY610	S1	R	BYX45*	S2	R
BUV82	S4	P	BYV20	S2	R	BYX46*	S2	R
BUV83	S4	P	BYV21*	S2	R	BYX49*	S2	R
BUW84	S4	P	BYV22	S2	R	BYX50*	S2	R
BUW85	S4	P	BYV23	S2	R	BYX52*	S2	R
BUX46;A	S4	P	BYV24	S2	R	BYX56*	S2	R
BUX47;A	S4	P	BYV27	S1	R	BYX71*	S2	R
BUX48;A	S4	P	BYV28	S1	R	BYX90	S1	R
BUX80	S4	P	BYV30*	S2	R	BYX91*	S1	R
BUX81	S4	P	BYV32*	S2	R	BYX94	S1	R
BUX82	S4	P	BYV92*	S2	R	BYX96*	S2	R
BUX83	S4	P	BYV95A	S1	R	BYX97*	S2	R
BUX84	S4	P	BYV95B	S1	R	BYX98*	S2	R
BUX85	S4	P	BYV95C	S1	R	BYX99*	S2	R
BUX86	S4	P	BYV96D	S1	R	BZT03	S1	Vrg
BUX87	S4	P	BYV96E	S1	R	BZV10	S1	Vrf
BUX98	S4	P	BYW19*	S2	R	BZV11	S1	Vrf
BUY89	S4	P	BYW25	S2	R	BZV12	S1	Vrf
BY184	S1	R	BYW29*	S2	R	BZV13	S1	Vrf
BY188G	S1	R	BYW30*	S2	R	BZV14	S1	Vrf
BY223	S2	R	BYW31*	S2	R	BZV15*	S2	Vrg

* = series
D = Displays
GD = Germanium diodes
LED = Light emitting diodes
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Ph = Photoconductive devices
PhC = Photocouplers
R = Rectifier diodes
St = Rectifier stacks

type no.	book	section	type no.	book	section	type no.	book	section
BZV37	S1	Vrf	CQ332;R	S8	D	CQY58A	S8	LED
BZV46	S1	Vrg	CQ427;R	S8	D	CQY89A	S8	LED
BZV49*	S1/S7	Vrg	CQ430;R	S8	D	CQY94	S8	LED
BZV85	S1	Vrg	CQ431;R	S8	D	CQY95	S8	LED
BZW70*	S2	TS	CQ432;R	S8	D	CQY96	S8	LED
BZW86*	S2	TS	CQL10	S8	LED	CQY97	S8	LED
BZW91*	S2	TS	CQW10	S8	LED	OA90	S1	GD
BZX55	S1	Vrg	CQW11	S8	LED	OA91	S1	GD
BZX70*	S2	Vrg	CQW12	S8	LED	OA95	S1	GD
BZX75	S1	Vrg	CQX10	S8	LED	OM320	S10	WBM
BZX79*	S1	Vrg	CQX11	S8	LED	OM321	S10	WBM
BZX84*	S7/S1	Mm/Vrg	CQX12	S8	LED	OM322	S10	WBM
BZX87*	S1	Vrg	CQX51	S8	LED	OM323	S10	WBM
BZX90	S1	Vrf	CQX54	S8	LED	OM323A	S10	WBM
BZX91	S1	Vrf	CQX55	S8	LED	OM335	S10	WBM
BZX92	S1	Vrf	CQX56	S8	LED	OM336	S10	WBM
BZX93	S1	Vrf	CQX57	S8	LED	OM337	S10	WBM
BZX94	S1	Vrf	CQX58	S8	LED	OM337A	S10	WBM
BZY91*	S2	Vrg	CQX60	S8	LED	OM339	S10	WBM
BZY93*	S2	Vrg	CQX61	S8	LED	OM345	S10	WBM
BZY95*	S2	Vrg	CQX62	S8	LED	OM350	S10	WBM
BZY96*	S2	Vrg	CQX63	S8	LED	OM360	S10	WBM
CNX21	S8	PhC	CQX64	S8	LED	OM361	S10	WBM
CNX35	S8	PhC	CQX65	S8	LED	OM370	S10	WBM
CNX36	S8	PhC	CQX66	S8	LED	OM931	S4	P
CNX38	S8	PhC	CQX67	S8	LED	OM961	S4	P
CNY48	S8	PhC	CQX68	S8	LED	ORP60	S8	Ph
CNY50	S8	PhC	CQX74	S8	LED	ORP61	S8	Ph
CNY52	S8	PhC	CQX75	S8	LED	ORP62	S8	Ph
CNY53	S8	PhC	CQX76	S8	LED	ORP66	S8	Ph
CNY57	S8	PhC	CQX77	S8	LED	ORP68	S8	Ph
CNY57A	S8	PhC	CQX78	S8	LED	ORP69	S8	Ph
CNY62	S8	PhC	CQY11B	S8	LED	OSB9110	S2	St
CNY63	S8	PhC	CQY11C	S8	LED	OSB9210	S2	St
CQ209S	S8	D	CQY24B	S8	LED	OSB9410	S2	St
CQ216X	S8	D	CQY49B	S8	LED	OSM9110	S2	St
CQ216Y	S8	D	CQY49C	S8	LED	OSM9210	S2	St
CQ327;R	S8	D	CQY50	S8	LED	OSM9410	S2	St
CQ330;R	S8	D	CQY52	S8	LED	OSM9510	S2	St
CQ331;R	S8	D	CQY54	S8	LED	OSM9511	S2	St

Th = Thyristors
Tri = Triacs
TS = Transient suppressor diodes

Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes
WBM = Wideband hybrid IC modules

type no.	book	section	type no.	book	section	type no.	book	section
OSM9512	S2	St	1N3901	S2	R	2N2222A	S3	Sm
OSS9110	S2	St	1N3902	S2	R	2N2297	S3	Sm
OSS9210	S2	St	1N3903	S2	R	2N2368	S3	Sm
OSS9410	S2	St	1N3909	S2	R	2N2369	S3	Sm
PH2222;R	S3	Sm	1N3910	S2	R	2N2369A	S3	Sm
PH2222A;R	S3	Sm	1N3911	S2	R	2N2483	S3	Sm
PH2369	S3	Sm	1N3912	S2	R	2N2484	S3	Sm
PH2907;R	S3	Sm	1N3913	S2	R	2N2904	S3	Sm
PH2907A;R	S3	Sm	1N4001G	S1	R	2N2904A	S3	Sm
PH40*	S2	R	1N4002G	S1	R	2N2905	S3	Sm
PH70*	S2	R	1N4003G	S1	R	2N2905A	S3	Sm
RPY58A	S8	Ph	1N4004G	S1	R	2N2906	S3	Sm
RPY82	S8	Ph	1N4005G	S1	R	2N2906A	S3	Sm
RPY84	S8	Ph	1N4006G	S1	R	2N2907	S3	Sm
RPY85	S8	Ph	1N4007G	S1	R	2N2907A	S3	Sm
RPY86	S8	I	1N4148	S1	SD	2N3019	S3	Sm
RPY87	S8	I	1N4150	S1	SD	2N3020	S3	Sm
RPY88	S8	I	1N4151	S1	SD	2N3053	S3	Sm
RPY89	S8	I	1N4154	S1	SD	2N3375	S6	RFP
RPY90*	S8	I	1N4446	S1	SD	2N3553	S6	RFP
RPY91*	S8	I	1N4448	S1	SD	2N3632	S6	RFP
RPY93	S8	I	1N4531	S1	SD	2N3822	S5	FET
RPY96	S8	I	1N4532	S1	SD	2N3823	S5	FET
1N821;A	S1	Vrf	1N5059	S1	R	2N3866	S6	RFP
1N823;A	S1	Vrf	1N5060	S1	R	2N3903	S3	Sm
1N825;A	S1	Vrf	1N5061	S1	R	2N3904	S3	Sm
1N827;A	S1	Vrf	1N5062	S1	R	2N3905	S3	Sm
1N829;A	S1	Vrf	2N918	S10	WBT	2N3906	S3	Sm
1N914	S1	SD	2N929	S3	Sm	2N3924	S6	RFP
1N916	S1	SD	2N930	S3	Sm	2N3926	S6	RFP
1N3879	S2	R	2N1613	S3	Sm	2N3927	S6	RFP
1N3880	S2	R	2N1711	S3	Sm	2N3966	S5	FET
1N3881	S2	R	2N1893	S3	Sm	2N4030	S3	Sm
1N3882	S2	R	2N2218	S3	Sm	2N4031	S3	Sm
1N3889	S2	R	2N2218A	S3	Sm	2N4032	S3	Sm
1N3890	S2	R	2N2219	S3	Sm	2N4033	S3	Sm
1N3891	S2	R	2N2219A	S3	Sm	2N4091	S5	FET
1N3892	S2	R	2N2221	S3	Sm	2N4092	S5	FET
1N3899	S2	R	2N2221A	S3	Sm	2N4093	S5	FET
1N3900	S2	R	2N2222	S3	Sm	2N4123	S3	Sm

FET = Field-effect transistors
I = Infrared devices
Ph = Photoconductive devices
R = Rectifier diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
St = Rectifier stacks
Vrf = Voltage reference diodes
WBT = Wideband hybrid IC transistors

type no.	book	section	type no.	book	section	type no.	book	section
2N4124	S3	Sm	56231	S2	HE	56352	S4	A
2N4125	S3	Sm	56245	S3,6,10	A	56353	S4	A
2N4126	S3	Sm	56246	S3,5,10	A	56354	S4	A
2N4391	S5	FET	56253	S2	DH	56359b	S4	A
2N4392	S5	FET	56256	S2	DH	56359c	S4	A
2N4393	S5	FET	56261a	S4	A	56359d	S4	A
2N4427	S6	RFP	56262A	S2	A	56360a	S4	A
2N4856	S5	FET	56264A	S2	A	56363	S2,S4	A
2N4857	S5	FET	56268	S2	DH	56364	S2,S4	A
2N4858	S5	FET	56290	S2	HE	56366	S2	A
2N4859	S5	FET	56295	S2	A	56367	S2,S4	A
2N4860	S5	FET	56312	S2	DH	56368a	S4	A
2N4861	S5	FET	56313	S2	DH	56368b	S4	A
2N5415	S3	Sm	56316	S2	A	56369	S2,S4	A
2N5416	S3	Sm	56317	S2	A	56378	S4	A
61SV	S8	I	56326	S4	A	56378	S4	A
368BPY	S8	PDT	56333	S4	A	56379	S4	A
56201d	S4	A	56339	S4	A	56387a,b	S4	A
56201j	S4	A	56348	S2	DH			
56230	S2	HE	56350	S2	DH			

A = Accessories
DH = Diecast heatsinks
FET = Field-effect transistors
HE = Heatsink extrusions
I = Infrared devices
PDT = Photodiodes or transistors
RFP = R.F. power transistors and modules
Sm = Small-signal transistors

GENERAL

Type designation
Rating systems
Letter symbols
s-parameters

PRO ELECTRON TYPE DESIGNATION CODE FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete semiconductor devices – as opposed to integrated circuits –, multiples of such devices and semiconductor chips.

A basic type number consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

FIRST LETTER

The first letter gives information about the material used for the active part of the devices.

A. GERMANIUM or other material with band gap of 0,6 to 1,0 eV.
B. SILICON or other material with band gap of 1,0 to 1,3 eV.
C. GALLIUM-ARSENIDE or other material with band gap of 1,3 eV or more.
R. COMPOUND MATERIALS (e.g. Cadmium-Sulphide).

SECOND LETTER

The second letter indicates the function for which the device is primarily designed.

A. DIODE; signal, low power
B. DIODE; variable capacitance
C. TRANSISTOR; low power, audio frequency ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
D. TRANSISTOR; power, audio frequency ($R_{th\ j\text{-}mb} \leq 15\ ^{o}C/W$)
E. DIODE; tunnel
F. TRANSISTOR; low power, high frequency ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
G. MULTIPLE OF DISSIMILAR DEVICES – MISCELLANEOUS; e.g. oscillator
H. DIODE; magnetic sensitive
L. TRANSISTOR; power, high frequency ($R_{th\ j\text{-}mb} \leq 15\ ^{o}C/W$)
N. PHOTO-COUPLER
P. RADIATION DETECTOR; e.g. high sensitivity phototransistor
Q. RADIATION GENERATOR; e.g. light-emitting diode (LED)
R. CONTROL AND SWITCHING DEVICE; e.g. thyristor, low power ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
S. TRANSISTOR; low power, switching ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j\text{-}mb} \leq 15\ ^{o}C/W$)
U. TRANSISTOR; power, switching ($R_{th\ j\text{-}mb} \leq 15\ ^{o}C/W$)
X. DIODE: multiplier, e.g. varactor, step recovery
Y. DIODE; rectifying, booster
Z. DIODE; voltage reference or regulator (transient suppressor diode, with third letter W)

SERIAL NUMBER

Three figures, running from 100 to 999, for devices primarily intended for consumer equipment.*
One letter (Z, Y, X, etc.) and two figures, running from 10 to 99, for devices primarily intended for industrial/professional equipment.*
This letter has no fixed meaning except W, which is used for transient suppressor diodes.

VERSION LETTER

It indicates a minor variant of the basic type either electrically or mechanically. The letter never has a fixed meaning, except letter R, indicating reverse voltage, e.g. collector to case or anode to stud.

SUFFIX

Sub-classification can be used for devices supplied in a wide range of variants called associated types. Following sub-coding suffixes are in use:

1. VOLTAGE REFERENCE and VOLTAGE REGULATOR DIODES: *ONE LETTER and ONE NUMBER*
   The LETTER indicates the nominal tolerance of the Zener (regulation, working or reference) voltage
   A. 1% (according to IEC 63: series E96)
   B. 2% (according to IEC 63: series E48)
   C. 5% (according to IEC 63: series E24)
   D. 10% (according to IEC 63: series E12)
   E. 20% (according to IEC 63: series E6)
   The number denotes the typical operating (Zener) voltage related to the nominal current rating for the whole range.
   The letter 'V' is used instead of the decimal point.

2. TRANSIENT SUPPRESSOR DIODES: *ONE NUMBER*
   The NUMBER indicates the maximum recommended continuous reversed (stand-off) voltage V_R. The letter 'V' is used as above.

3. CONVENTIONAL and CONTROLLED AVALANCHE RECTIFIER DIODES and THYRISTORS: *ONE NUMBER*
   The NUMBER indicates the rated maximum repetitive peak reverse voltage (V_{RRM}) or the rated repetitive peak off-state voltage (V_{DRM}), whichever is the lower. Reversed polarity is indicated by letter R, immediately after the number.

4. RADIATION DETECTORS: *ONE NUMBER*, preceded by a hyphen (–)
   The NUMBER indicates the depletion layer in μm. The resolution is indicated by a version LETTER.

5. ARRAY OF RADIATION DETECTORS and GENERATORS: *ONE NUMBER*, preceded by a stroke (/).
   The NUMBER indicates how many basic devices are assembled into the array.

→ * When these serial numbers are exhausted the serial number for consumer types may be extended to four figures, and that for industrial types to three figures.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note
This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note
Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note
The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

I, i = current
V, v = voltage
P, p = power.

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.
In all other instances upper-case basic letters shall be used.

Subscripts

A, a	Anode terminal
(AV), (av)	Average value
B, b	Base terminal, for MOS devices: Substrate
(BR)	Breakdown
C, c	Collector terminal
D, d	Drain terminal
E, e	Emitter terminal
F, f	Forward
G, g	Gate terminal
K, k	Cathode terminal
M, m	Peak value
O, o	As third subscript: The terminal not mentioned is open circuited
R, r	As first subscript: Reverse. As second subscript: Repetitive. As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.
(RMS), (rms)	R.M.S. value
S, s	As first or second subscript: Source terminal (for FETS only) As second subscript: Non-repetitive (not for FETS) As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d.c. values.

Upper-case subscripts shall be used for the indication of:

a) continuous (d.c.) values (without signal)
Example I_B

b) instantaneous total values
Example i_B

c) average total values
Example $I_{B(AV)}$

d) peak total values
Example I_{BM}

e) root-mean-square total values
Example $I_{B(RMS)}$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

a) instantaneous values
Example i_b

b) root-mean-square values
Example $I_{b(rms)}$

c) peak values
Example I_{bm}

d) average values
Example $I_{b(av)}$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B, i_B, i_b, I_{bm}

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript F or f should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript R or r should be used.

Examples: I_F, I_R, i_F, $I_{f(rms)}$

Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: V_{BE}, v_{BE}, v_{be}, V_{bem}

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript F or f should be used; for a reverse voltage (anode negative with respect to cathode) the subscript R or r should be used.

Examples: V_F, V_R, v_F, V_{rm}

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: V_{CC}, I_{EE}

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example : V_{CCE}

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{B2} = continuous (d.c.) current flowing into the second base terminal

V_{B2-E} = continuous (d.c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

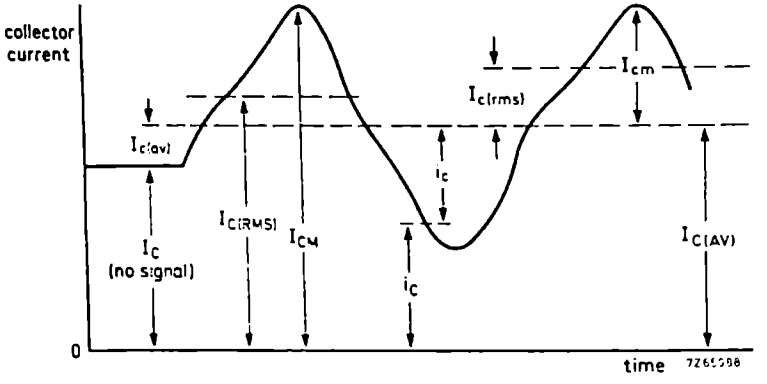
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{2C} = continuous (d.c.) current flowing into the collector terminal of the second unit

V_{1C-2C} = continuous (d.c.) voltage between the collector terminals of the first and the second unit.

Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d.c.) current and a varying component.



LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Definition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

B, b = susceptance; imaginary part of an admittance

C = capacitance

G, g = conductance; real part of an admittance

H, h = hybrid parameter

L = inductance

R, r = resistance; real part of an impedance

X, x = reactance; imaginary part of an impedance

Y, y = admittance;

Z, z = impedance;

Upper-case letters shall be used for the representation of:

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

F, f = forward; forward transfer
I, i (or 1) = input
L, l = load
O, o (or 2) = output
R, r = reverse; reverse transfer
S, s = source

Examples: Z_S, h_f, h_F

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples : h_{FE} = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)

R_E = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

$Z_e = R_e + jX_e$ = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: h_{FE}, y_{RE}, h_{fe}

Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer

Examples: h_i (or h_{11})
h_o (or h_{22})
h_f (or h_{21})
h_r (or h_{12})

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: h_{fe} (or h_{21e}), h_{FE} (or h_{21E})

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

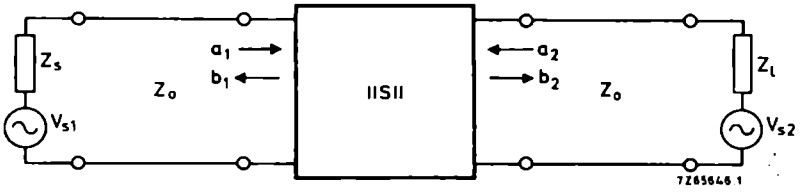
Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: Re (h_{ib}) etc. for the real part of h_{ib}
Im (h_{ib}) etc. for the imaginary part of h_{ib}

SCATTERING PARAMETERS

In distinction to the conventional h, y and z-parameters, s-parameters relate to travelling wave conditions. The figure below shows a two-port network with the incident and reflected waves a_1, b_1, a_2 and b_2.



$$a_1 = \frac{V_{i1}}{\sqrt{Z_o}} \qquad a_2 = \frac{V_{i2}}{\sqrt{Z_o}} \qquad 1)$$

$$b_1 = \frac{V_{r1}}{\sqrt{Z_o}} \qquad b_2 = \frac{V_{r2}}{\sqrt{Z_o}}$$

Z_o = characteristic impedance of the transmission line in which the two-port is connected.

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

$$b_1 = s_{11}a_1 + s_{12}a_2$$
$$b_2 = s_{21}a_1 + s_{22}a_2$$

Using the subscripts i for 11, r for 12, f for 21 and o for 22, it follows that:

$$s_i = s_{11} = \frac{b_1}{a_1}\bigg|_{a_2 = 0}$$

$$s_r = s_{12} = \frac{b_1}{a_2}\bigg|_{a_1 = 0}$$

$$s_f = s_{21} = \frac{b_2}{a_1}\bigg|_{a_2 = 0}$$

$$s_o = s_{22} = \frac{b_2}{a_2}\bigg|_{a_1 = 0}$$

1) The squares of these quantities have the dimension of power.

The s-parameters can be named and expressed as follows:

$s_i = s_{11}$ = Input reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the input, under the conditions $Z_1 = Z_o$ and $V_{s2} = 0$.

$s_r = s_{12}$ = Reverse transmission coefficient.
The complex ratio of the generated wave at the input and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

$s_f = s_{21}$ = Forward transmission coefficient.
The complex ratio of the generated wave at the output and the incident wave at the input, under the conditions $Z_1 = Z_o$ and $V_{s2} = 0$

$s_o = s_{22}$ = Output reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

WIDEBAND TRANSISTORS

Type number survey
Selection guide
Soldering recommendations SOT-37
Soldering recommendations SOT-48
and SOT-122
Accessories

	polarity			RATINGS			CHARACTERISTICS (typical values unless otherwise specified)							
	n-p-n	p-n-p	envelope	V_{CEO} V	I_C mA	P_{tot} mW	f_T GHz	F dB	at f MHz	G_{UM} dB	at f MHz	V_o* (d_{im} = -60 dB mV	I_C mA	V_{CE} V
BF689K	•		TO-92	15	25	360	1,8	3	200	16	200			
BFG90A	•		SOT-103	15	25	180	5	–	–	18	800			
BFG91A	•		SOT-103	12	35	300	6		–	17	800			
BFG96	•		SOT-103	15	150	500	5	–	–	14	800			
BFP90A	•		NO-243	15	30	250	5	2,4	800	19	800			
BFP91A	•		NO-243	12	50	350	6	2,3	800	18	800			
BFP96	•		NO-243	15	100	500	4,5	2,5	800	15	800			
BFQ22	•		TO-72	12	35	150	5	1,9	500	16	500		30	5
BFQ22S	•		TO-72	12	35	150	5	1,9	500	16	500	300	30	5
BFQ23		•	SOT-37	12	35	180	5	2,4	500	16,5	500	300	30	5
BFQ24		•	TO-72	12	35	150	5	2,4	500	15	500	300	30	5
BFQ32		•	SOT-37	15	75	500	4,2	3,75	500	14	500	500	50	10
BFQ33	•		SOT-100	7	20	140	12	2,5	2000	13	2000		14	5
BFQ34	•		SOT-122	18	150	2250	3,9	8	500	16,3	500	1200	120	15
BFQ34T	•		SOT-37	18	150	1000	3,7	–	–	20	300	750	90	10
BFQ51		•	SOT-37	15	25	180	5	2,7	500	19	500	150	14	10
BFQ52		•	TO-72	15	25	150	5	2,7	500	17	500	150	14	10
BFQ53	•		TO-72	15	25	150	5	2,4	500	18	500	150	14	10
BFQ63	•		TO-72	15	75	250	4,5	< 3,0	200	11,5	500	500	50	10
BFQ65	•		SOT-37	10	50	300	7,5	3	2000	8	2000			
BFQ66	•		NO-243	10	50	350	7,5	3	2000	12,5	2000			
BFQ68	•		SOT-122	18	300	4500	4	–	–	13	800	1600	240	15
BFR49	•		SOT-100	15	25	180	5	2,5	1000	17	1000		14	10
BFR64	•		SOT-48	25	200	3500	1	6	200					
BFR65	•		SOT-48	25	400	5000	> 1	–	–					
BFR90	•		SOT-37	15	25	180	5	2,4	500	19,5	500	150	14	10
BFR90A	•		SOT-37	15	25	180	5	1,8	800	20	500	150	14	10
BFR91	•		SOT-37	12	35	180	5	1,9	500	18	500	300	30	5
BFR91A	•		SOT-37	12	35	300	6	1,6	800	14	800	425	30	8
BFR94	•		SOT-48	25	150	3500	3,5	5	500	13,5	500	700	90	20

* *Typical reference value.*

	polarity			RATINGS			CHARACTERISTICS (typical values unless otherwise specified)							
	n-p-n	p-n-p	envelope	V_{CEO} V	I_C mA	P_{tot} mW	f_T GHz	F dB	at f MHz	G_{UM} dB	at f MHz	V_o* (d_{im} = −60 dB mV	I_C mA	V_{CE} V
BFR95	•		TO-39	25	150	1500	3,5	9	200			1000	80	18
BFR96	•		SOT-37	15	75	500	5	3,3	500	15,2	500	500	50	10
BFR96S	•		SOT-37	15	100	700	5	4	800	11,5	800	700	70	10
BFT24	•		SOT-37	5	2,5	30	2,3	3,8	500	17	500			
BFW16A	•		TO-39	25	150	1500	1,2	<6	200					
BFW17A	•		TO-39	25	150	1500	1,1	–	–					
BFW30	•		TO-72	10	50	250	1,6	<5	500			100	30	6
BFW92	•		SOT-37	15	25	190	1,6	4	500					
BFW92A	•		SOT-37	15	25	200	2,8	2,5	800	13	800	150	14	10
BFW93	•		SOT-37	10	50	190	1,7	<5	500	10,5	800	100	30	5
BFX89	•		TO-72	15	25	200	1,2	3,3	200					
BFY90	•		TO-72	15	25	200	1,4	2,5	200					
2N918	•		TO-72	15	50	200	<0,9	<6	60	36	200			

* Typical reference value.

This table shows the most preferred types of n-p-n transistors and their complements for wideband applications. It shows the types *in sequence of linear output voltage* capability in each type of envelope. The values of V_o are only given as a typical reference.

For detailed information see relevant data sheet.

	polarity		I_C (mA) V_{CE} (V)		14 10	30 5	30 8	50 10	70 10	80 10	90 10	120 15	240 15
envelope	n-p-n	p-n-p	V_o* (mV)		150	300	425	500	700		1000	1200	1600
SOT-37	•			BFT24	BFR90 BFR90A	BFR91 BFR91A	BFR91A	BFR96	BFR96S		BFQ34T		
		•			BFQ51	BFQ23		BFQ32					
SOT-23	•			BFT25	BFR92 BFR92A	BFR93 BFR93A	BFR93A						
		•			BFT92	BFT93							
SOT-89	•							BFQ19		BFQ18A			
SOT-122	•											BFQ34	BFQ68
TO-72	•				BFQ53	BFQ22S		BFQ63					
		•			BFQ52	BFQ24							
NEW TYPES (f_T: 5 GHz)													
SOT-103	•				BFG90A	BFG91A	BFG91A		BFG96				
NO-243	•				BFP90A	BFP91A		BFP96					
NEW TYPES (f_T: 7,5 GHz)													
SOT-37	•				BFQ65								
NO-243	•				BFQ66								
SOT-23	•				BFQ67								

* Typical output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone).

SOLDERING RECOMMENDATIONS SOT-37

Transistors in SOT-37 envelopes may be mounted with leads flat (Fig. 1) or bent (Figs 2 and 3). Different soldering procedures apply for the different styles of mounting.

FLAT-LEAD MOUNTING

Soldering by hand

Avoid putting any force on the leads during or just after soldering.

Solder the three leads one at a time, *not* simultaneously.

Proceed from one lead to the adjacent lead, *not* to the opposite one.

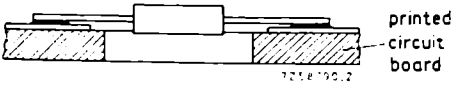


Fig. 1

Solder temperature	max.	300 °C
Soldering time	max.	5 s
Solder-to-case distance	min.	2 mm

BENT-LEAD MOUNTING

If leads are bent, all three may be soldered simultaneously if desired.

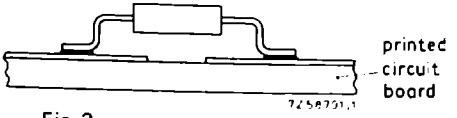


Fig. 2

Solder temperature	max.	300 °C
Soldering time	max.	10 s

DIP OR WAVE SOLDERING

When dip or wave soldering, the maximum allowable temperature of the solder is 260 °C. This temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted up to the lead projections, but the temperature of the body must not exceed the specified storage maximum.

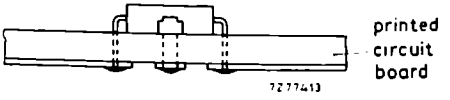


Fig. 3

Solder temperature	max.	260 °C
Soldering time	max.	5 s

RECOMMENDATIONS FOR MOUNTING ¼" CAPSTAN ENVELOPES

A brass nut is supplied with each transistor for securing it to a heatsink.

Screw thread, diameter and nuts:

stud diameter	thread	maximum diameter of threaded stud	nut thickness
¼"	8-32UNC-2A(B)	4,14 mm	3,5 mm SOT-48 5,0 mm SOT-122

To ensure optimum heat transfer and to avoid damage to the threaded stud of the transistor the following recommendations should be observed:

1. Diameter of the mounting hole in the heatsink 4,15 + 0,05; −0 mm (max. 4,2 mm).
2. Heatsink surfaces at the mounting hole to be flat, parallel, and free of burrs or oxydation.
3. Torque on nut: minimum 0,75 Nm (7,5 kgcm), maximum 0,85 Nm (8,5 kgcm).
4. Recommended distance from the top surface of the heatsink to surface of printed-circuit board: 2,9 + 0; −0,2 mm.

Tension in the transistor leads sets the limit on spacing between heatsink and printed-circuit board; in general, the leads can withstand more pull in the downward direction than in the upward direction.

Solder the leads to the connection pads with resin-cored tin-lead solder, using an iron of normal temperature. Soldering iron temperatures as high as 350 °C are safely tolerable; the transistor can withstand an interior temperature of 250 °C for about ten minutes.

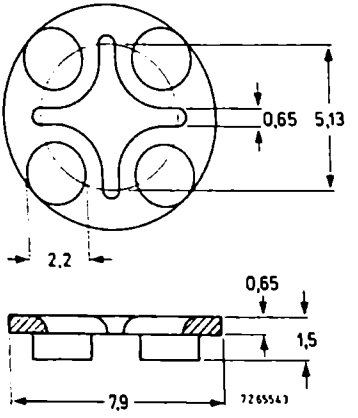
The leads may be tinned, if required, by dipping them into a solder bath at about 230 °C; each lead may be dipped up to its full length. A flux of the quality of Super-Safe is recommended; after tinning, surplus flux should be rinsed away with tap water.

DISTANCE DISCS

MECHANICAL DATA Dimensions in mm

Fig. 1 **56245** for **TO-5** or **TO-39.**

Insulating material;

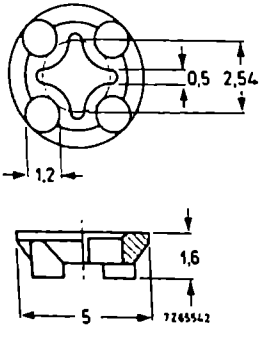


TEMPERATURE

Maximum permissible temperature T max. 100 °C

Fig. 2 **56246** for **TO-18** or **TO-72.**

Insulating material.



TEMPERATURE

Maximum permissible temperature T max. 100 °C

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-92 envelope intended for application as an amplifier or oscillator in the v.h.f. and u.h.f. range.

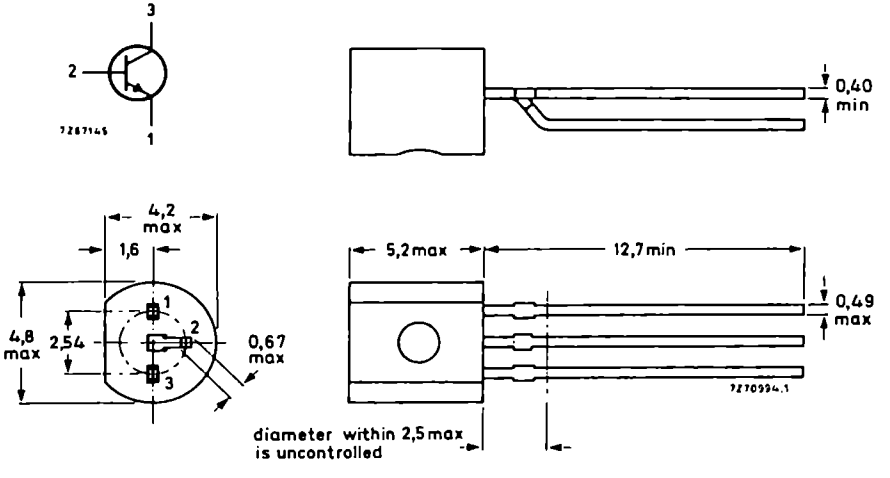
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	360	mW
D.C. current gain				
I_C = 2 mA; V_{CE} = 5 V	h_{FE}	>	20	
I_C = 20 mA; V_{CE} = 5 V		35 to	70	
Transition frequency at f = 500 MHz				
I_C = 15 mA; V_{CE} = 5 V	f_T	typ.	1,8	GHz

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-92 variant.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage			
$R_{BE} \leq 50\ \Omega$	V_{CER}	max.	25 V
$I_B = 0$	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current			
average	I_{CAV}	max.	25 mA
peak value; $t_{on} < 1\ \mu s$	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 60\ ^oC$	P_{tot}	max.	360 mW
Junction temperature	T_j	max.	150 °C
Storage temperature	T_{stg}	−55 to +150	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	max.	250 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Collector cut-off current			
$V_{CB} = 15$ V; $I_E = 0$	I_{CBO}	max.	50 nA
Emitter cut-off current			
$V_{EB} = 2$ V; $I_C = 0$	I_{EBO}	max.	1 μA
Saturation voltages			
$I_C = 25$ mA; $I_B = 1{,}25$ mA	V_{CEsat}	max.	1 V
	V_{BEsat}	max.	1 V
D.C. current gain			
$I_C = 2$ mA; $V_{CE} = 5$ V	h_{FE}	min.	20
$I_C = 20$ mA; $V_{CE} = 5$ V		35 to	70
Transition frequency at f = 500 MHz			
$I_C = 15$ mA; $V_{CE} = 5$ V	f_T	typ.	1,8 GHz
Feedback capacitance			
$I_C = 2$ mA; $V_{CE} = 5$ V	C_{re}	typ.	1,1 pF
Noise figure at f = 100 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 60\ \Omega$	F	typ.	4 dB
Noise figure at f = 200 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 60\ \Omega$	F	typ.	3 dB
Power gain at f = 100 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 60\ \Omega$; $R_L = 2$ kΩ	G_P	typ.	16 dB
Power gain at f = 200 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 60\ \Omega$; $R_L = 920\ \Omega$	G_P	typ.	16 dB

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a four-lead, dual emitter plastic envelope.

This device is designed for application in high gain broadband systems up to 1 GHz.

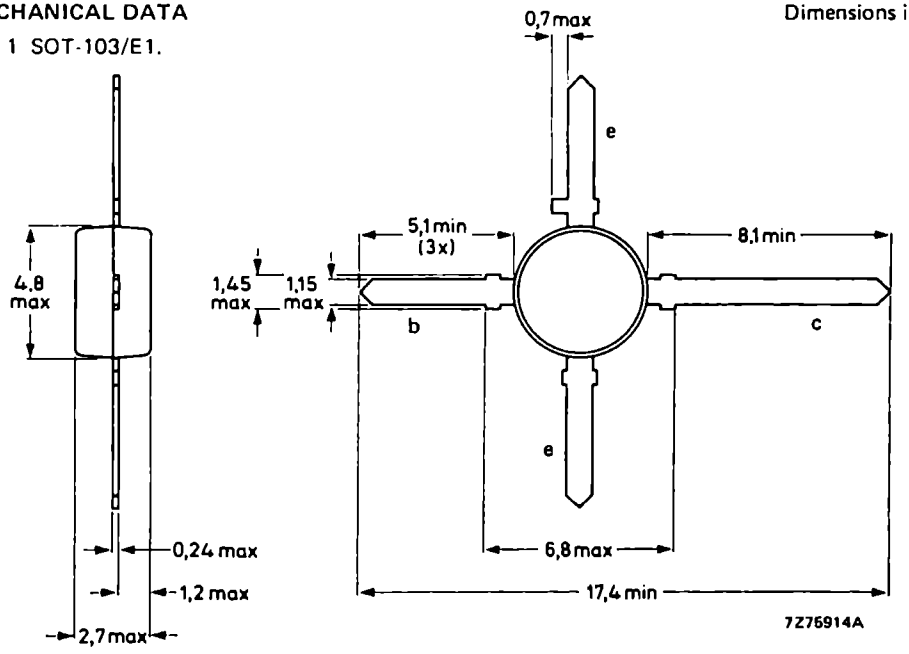
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20	V
Collector-emitter voltage	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	150	°C
D.C. current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min. typ.	40 90	
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5,0	GHz
Maximum unilateral power gain at f = 800 MHz I_C = 14 mA; V_{CE} = 10 V	G_{UM}	typ.	18	dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103/E1.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C mounted on a p.c.b. of 40 mm x 25 mm x 1 mm and Cu-layer thickness of 35 μm	P_{tot}	max.	180 mW
Storage temperature	T_{stg}	−65 to + 150	°C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient mounted on a p.c.b. of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$		500 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz I_E = 14 mA; V_{CE} = 10 V	f_T	typ.	5,0 GHz
Collector output capacitance $I_E = i_e$ = 0; V_{CB} = 10 V	C_{oe}	typ.	0,7 pF
Collector feedback capacitance I_E = 0; V_{CB} = 10 V	C_{re}	typ.	0,35 pF
Maximum unilateral power gain at f = 800 MHz $G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe} \rvert^2}{[1 - \lvert s_{ie} \rvert^2][1 - \lvert s_{oe} \rvert^2]}$ I_E = 14 mA; V_{CE} = 10 V	G_{UM}	typ.	18 dB

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a four-lead, dual emitter plastic envelope.

This device is designed for application in high gain broadband systems up to 1 GHz.

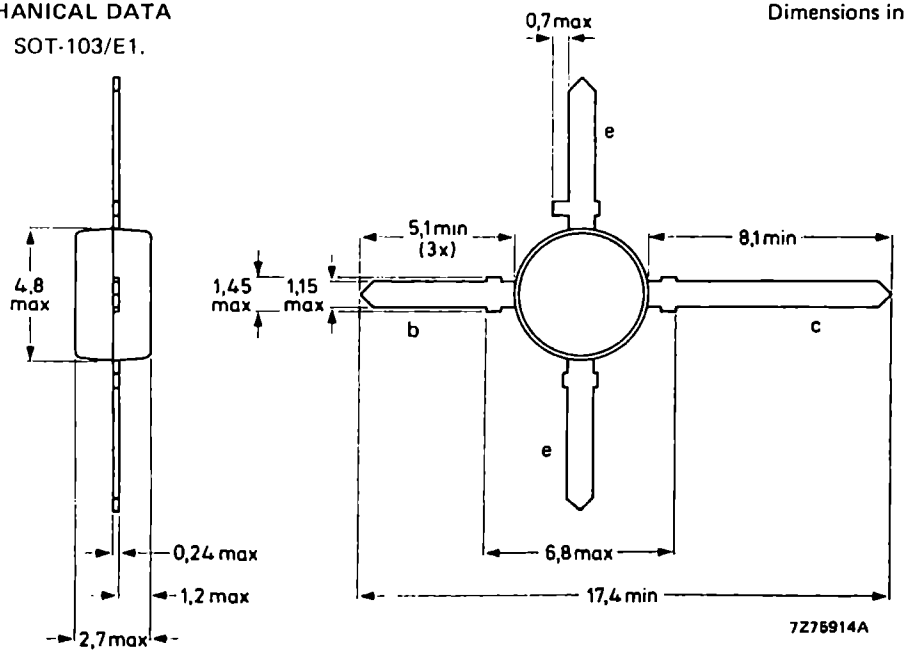
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	15 V
Collector-emitter voltage	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 °C
D.C. current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6,0 GHz
Maximum unilateral power gain at f = 800 MHz I_C = 30 mA; V_{CE} = 8 V	G_{UM}	typ.	17 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103/E1.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C mounted on a p.c.b. of 40 mm x 25 mm x 1 mm and Cu-layer thickness of 35 μm	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		−65 to + 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient mounted on a p.c.b. of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$		300 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 5 V	I_{CBO}	max.	50 nA
D.C. current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz I_E = 30 mA; V_{CE} = 5 V	f_T	typ.	6,0 GHz
Collector output capacitance $I_E = i_e$ = 0; V_{CB} = 10 V	C_{oe}	typ.	1,0 pF
Collector feedback capacitance I_E = 0; V_{CB} = 5 V	C_{re}	typ.	0,6 pF
Maximum unilateral power gain at f = 800 MHz $G_{UM}\ (\text{in dB}) = 10 \log \dfrac{\lvert s_{fe} \rvert^2}{[1-\lvert s_{ie} \rvert^2][1-\lvert s_{oe} \rvert^2]}$ I_E = 30 mA; V_{CE} = 8 V	G_{UM}	typ.	17 dB

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a four-lead, dual emitter plastic envelope.
This device is designed for application in high gain broadband systems up to 1 GHz.

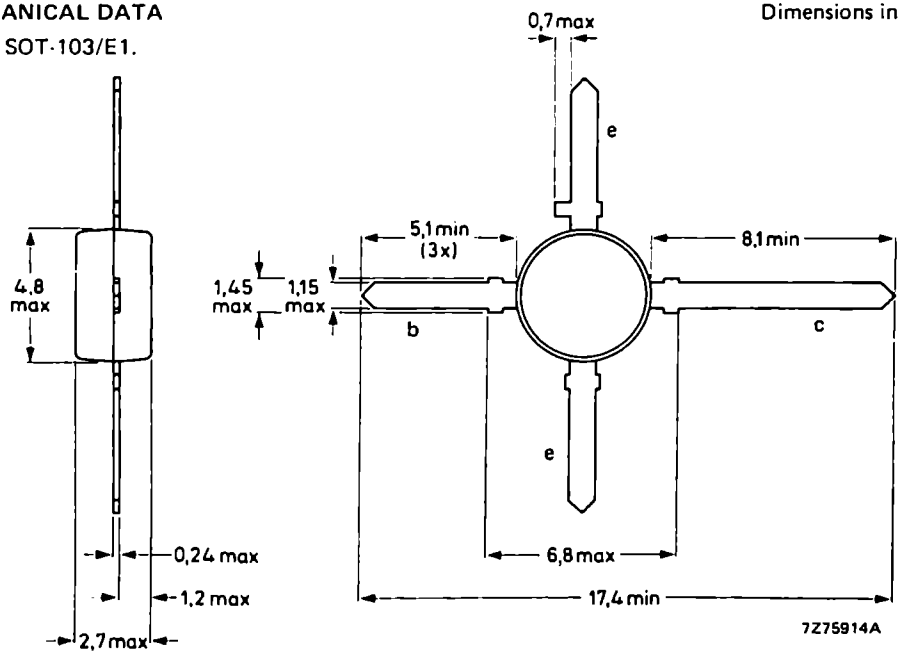
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20	V
Collector-emitter voltage	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	150	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
D.C. current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min. typ.	25 50	
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5,0	GHz
Maximum unilateral power gain at f = 800 MHz I_C = 50 mA; V_{CE} = 10 V	G_{UM}	typ.	14	dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103/E1.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,0 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{amb} = 60 °C mounted on a p.c.b. of 40 mm x 25 mm x 1,5 mm and Cu-layer thickness of 35 μm	P_{tot}	max.	500 mW
Storage temperature	T_{stg}		−65 to + 175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a p.c.b. of 40 mm x 25 mm x 1,5 mm	$R_{th\ j\text{-}a}$		230 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	100 nA
D.C. current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min. typ.	25 50
Transition frequency at f = 500 MHz I_E = 50 mA; V_{CE} = 10 V	f_T	typ.	5,0 GHz
Collector output capacitance $I_E = i_e$ = 0; V_{CB} = 10 V	C_{oe}	typ.	1,5 pF
Collector feedback capacitance I_E = 0; V_{CB} = 10 V	C_{re}	typ.	1,0 pF
Maximum unilateral power gain at f = 800 MHz $G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe} \rvert^2}{[1-\lvert s_{ie} \rvert^2][1-\lvert s_{oe} \rvert^2]}$ I_E = 50 mA; V_{CE} = 10 V	G_{UM}	typ.	14 dB

SILICON PLANAR EPITAXIAL TRANSISTOR

Gold-metallized n-p-n transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. The BFP90A features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

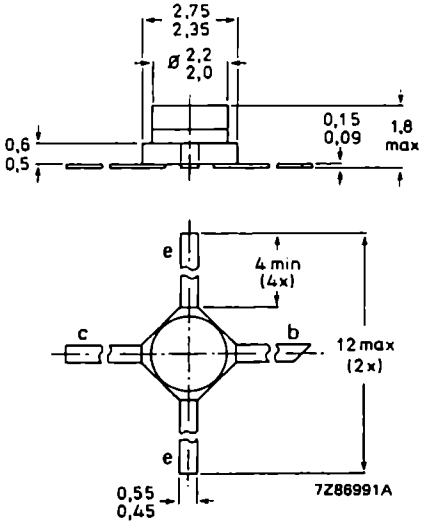
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	30 mA
Total power dissipation up to T_{amb} = 125 °C	P_{tot}	max.	250 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5,0 GHz
Maximum unilateral power gain I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C at f = 500 MHz at f = 800 MHz	G_{UM}	typ. typ.	24 dB 19 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 NO-243.



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RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	30 mA
Total power dissipation up to T_{amb} = 125 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$		200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5,0 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	0,6 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2]\ [1 - |s_{oe}|^2]}$$

at I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C f = 500 MHz f = 800 MHz	G_{UM}	typ. typ.	24 dB 19 dB
Noise figure at f = 800 MHz; R_S = opt.; T_{amb} = 25 °C I_C = 4 mA; V_{CE} = 10 V I_C = 14 mA; V_{CE} = 10 V	F	typ. typ.	1,7 dB 2,4 dB

SILICON PLANAR EPITAXIAL TRANSISTOR

Gold-metallized n-p-n transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. The BFP91A features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

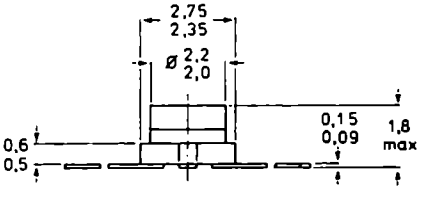
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	15 V
Collector-emitter voltage	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C	P_{tot}	max.	350 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6,0 GHz
Maximum unilateral power gain I_C = 30 mA; V_{CE} = 8 V; T_{amb} = 25 °C at f = 500 MHz at f = 800 MHz	G_{UM}	typ. typ.	22 dB 18 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 NO-243.



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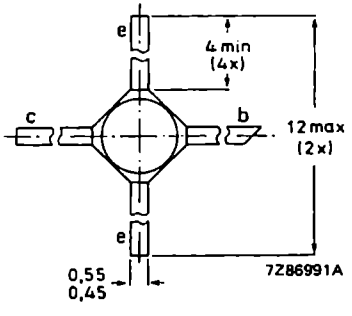


RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	350 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$		200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6,0 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	0,7 pF
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2]\,[1-\lvert s_{oe}\rvert^2]}$ at I_C = 30 mA; V_{CE} = 8 V; T_{amb} = 25 °C			
f = 500 MHz f = 800 MHz	G_{UM}	typ. typ.	22 dB 18 dB
Noise figure at f = 800 MHz; R_S = opt.; T_{amb} = 25 °C I_C = 4 mA; V_{CE} = 8 V I_C = 30 mA; V_{CE} = 8 V	F	typ. typ.	1,6 dB 2,3 dB

SILICON PLANAR EPITAXIAL TRANSISTOR

Gold-metallized n-p-n transistor in a sub-miniature HERMETICALLY SEALED microstripline envelope. The BFP96 features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

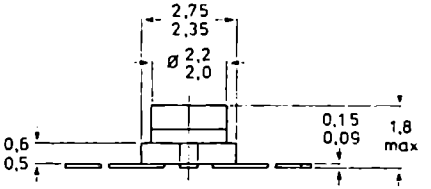
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to T_{amb} = 75 °C	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	4,5 GHz
Maximum unilateral power gain I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C			
at f = 500 MHz	G_{UM}	typ.	19 dB
at f = 800 MHz		typ.	15 dB

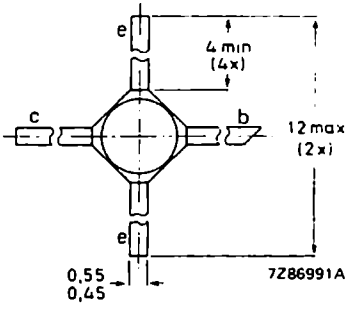
MECHANICAL DATA

Dimensions in mm

Fig. 1 NO-243.



Marking code: P6



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,0 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to T_{amb} = 75 °C mounted on a ceramic substrate of 0,7 mm × 10 cm²	P_{tot}	max.	500 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm × 10 cm²	$R_{th\ j\text{-}a}$		200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	100 nA
D.C. current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	4,5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	1,4 pF
Maximum unilateral power gain (s_{re} assumed to be zero) $G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe} \rvert^2}{[1 - \lvert s_{ie} \rvert^2]\,[1 - \lvert s_{oe} \rvert^2]}$ at I_C = 50 mA, V_{CE} = 10 V; T_{amb} = 25 °C			
f = 500 MHz	G_{UM}	typ.	19 dB
f = 800 MHz	G_{UM}	typ.	15 dB
Noise figure at f = 800 MHz; R_S = opt.; T_{amb} = 25 °C I_C = 10 mA; V_{CE} = 10 V	F	typ.	2,5 dB

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

P-N-P complement is BFQ24.

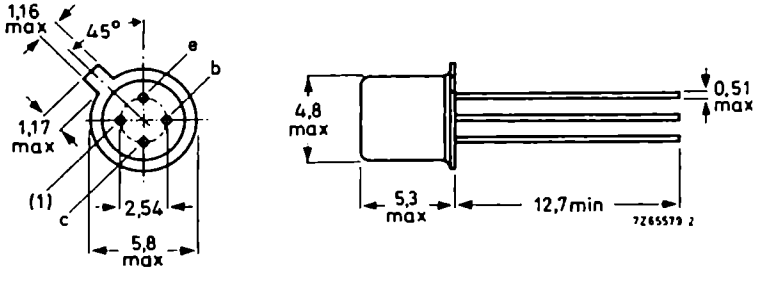
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0,7 pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9 dB
Maximum unilateral power gain (see page 2) I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	16,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	35 mA
Collector current (peak value) at f > 1 MHz	I_{CM}	max.	50 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,9 K/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0,6 K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50 nA
D.C. current gain (note 1) I_C = 30 mA; V_{CE} = 5 V	h_{FE}	> typ.	25 50
Transition frequency (notes 1 and 2) I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	5 GHz
Collector capacitance (note 2) $I_E = I_e$ = 0; V_{CB} = 5 V; f = 1 MHz	C_c	typ.	1,1 pF
Emitter capacitance $I_C = I_c$ = 0; V_{EB} = 0,5 V; f = 1 MHz	C_e	typ.	2,5 pF
Feedback capacitance (note 2) I_C = 0; V_{CE} = 5 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	0,7 pF
Noise figure at optimum source impedance (note 2) I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9 dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero $G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	16,0 dB

Notes
1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead not connected.

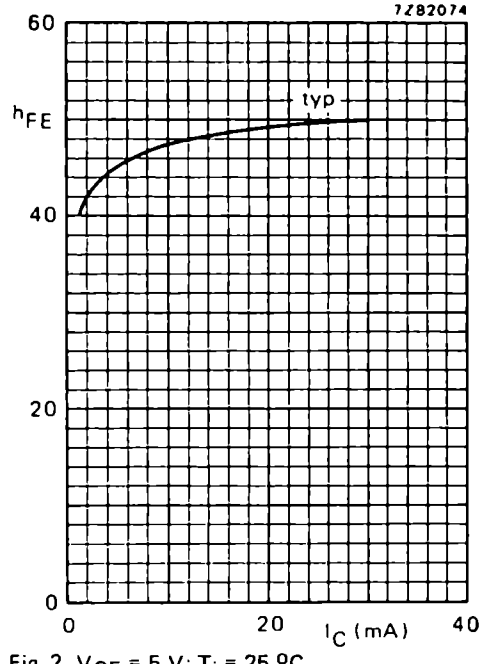


Fig. 2 V_{CE} = 5 V; T_j = 25 °C.

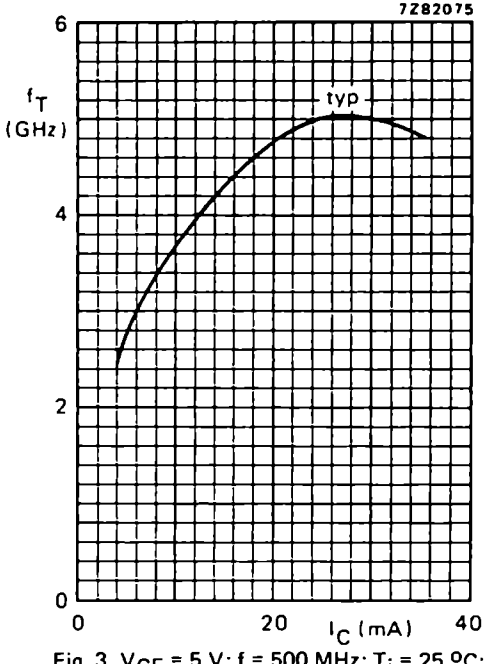


Fig. 3 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

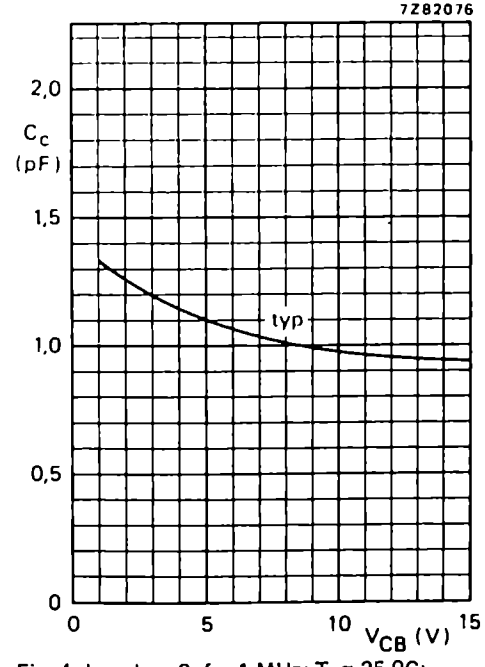


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C; shield lead not connected.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor has extremely high power gain and good low noise performance.

P-N-P complement is BFQ24.

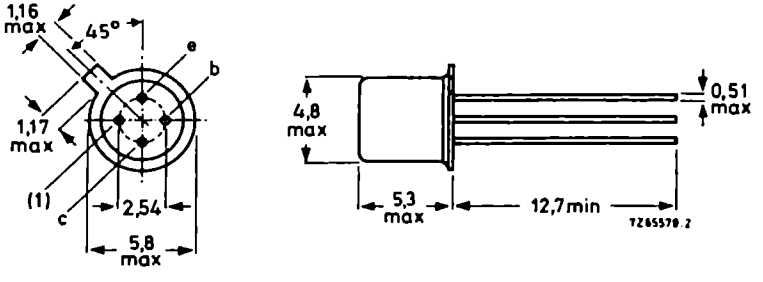
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0,65 pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9 dB
Maximum unilateral power gain (see page 2) I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	16,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) Shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	35 mA
Collector current (peak value) at f > 1 MHz	I_{CM}	max.	50 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}	−65 to +	200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE (note 1)

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	900 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	600 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50 nA
D.C. current gain (note 2)			
I_C = 10 mA; V_{CE} = 5 V	h_{FE}	50 to 150	
Transition frequency (notes 2 and 3)			
I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	5 GHz
Feedback capacitance (note 3)			
I_C = 0; V_{CE} = 5 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	0,65 pF
Noise figure at optimum source impedance (note 3)			
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9 dB
I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	F	<	2,5 dB
Maximum unilateral power gain (note 3)			
s_{re} assumed to be zero			
$G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$			
I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	>	21,0 dB
I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	16,0 dB

Notes

1. K/W is SI unit for °C/W.
2. Measured under pulse conditions.
3. Shield lead grounded.

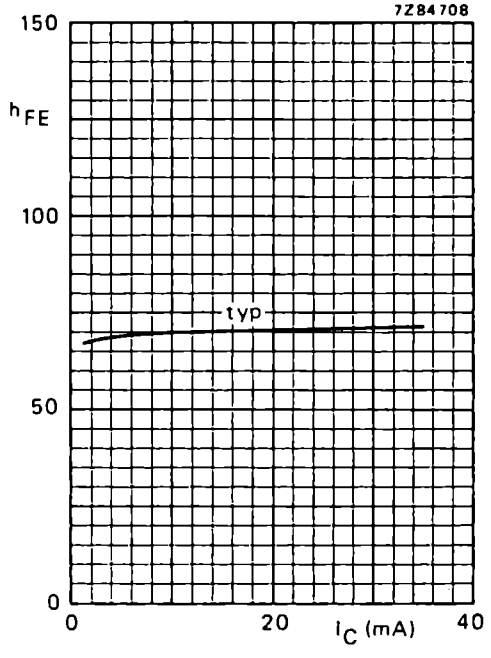


Fig. 2.

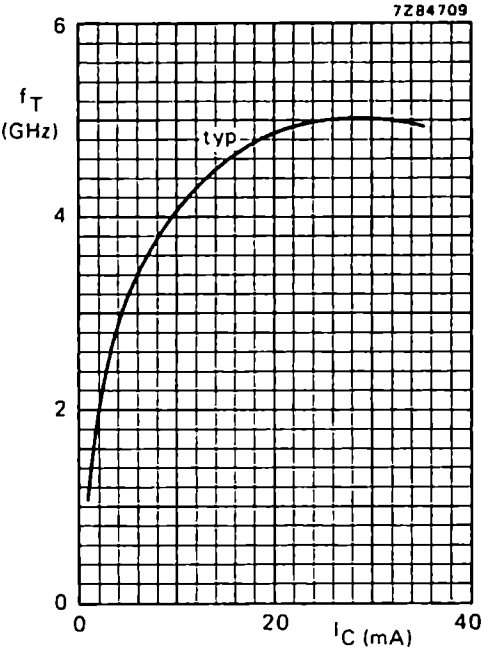


Fig. 3.

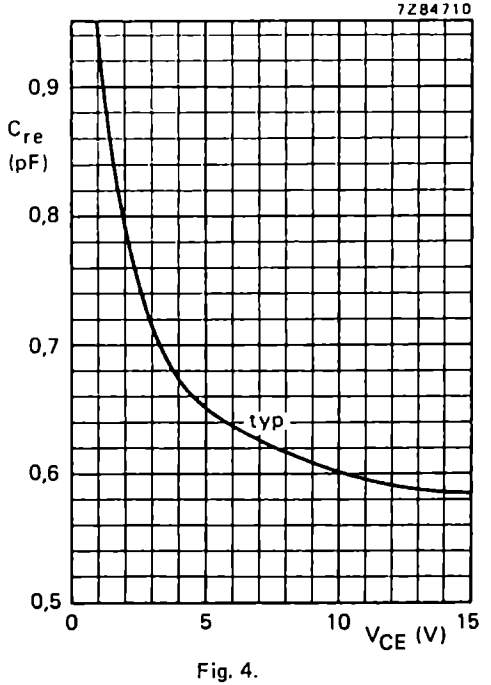


Fig. 4.

Conditions for Figs 2, 3 and 4:

Fig. 2 V_{CE} = 5 V; T_j = 25 °C.

Fig. 3 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

Fig. 4 I_C = 0; f = 1 MHz; T_{amb} = 25 °C; shield lead grounded.

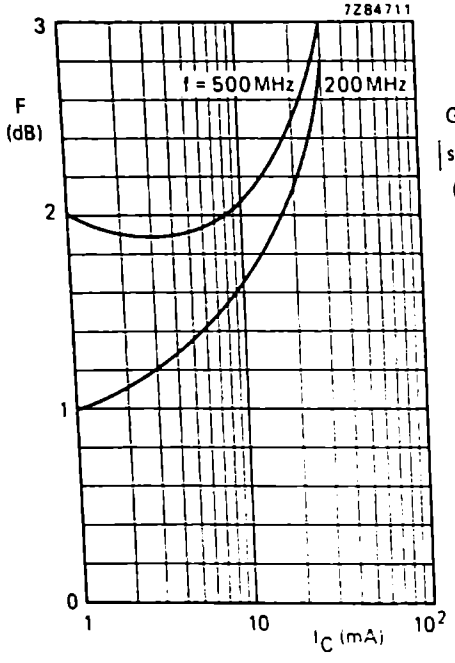


Fig. 5 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values; shield lead grounded.

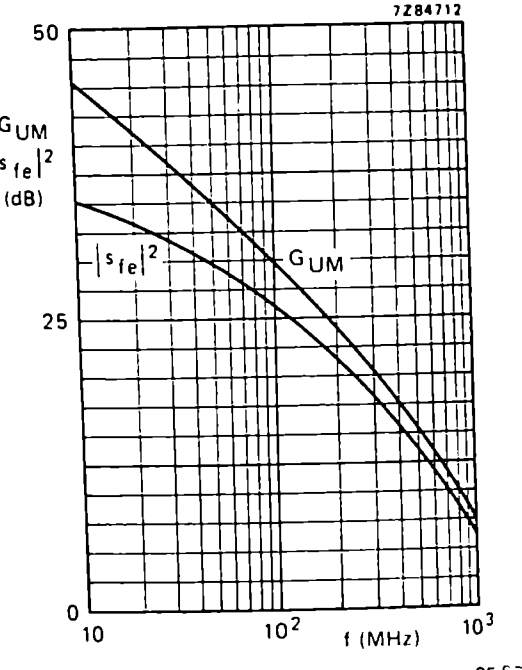


Fig. 6 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values; shield lead grounded.

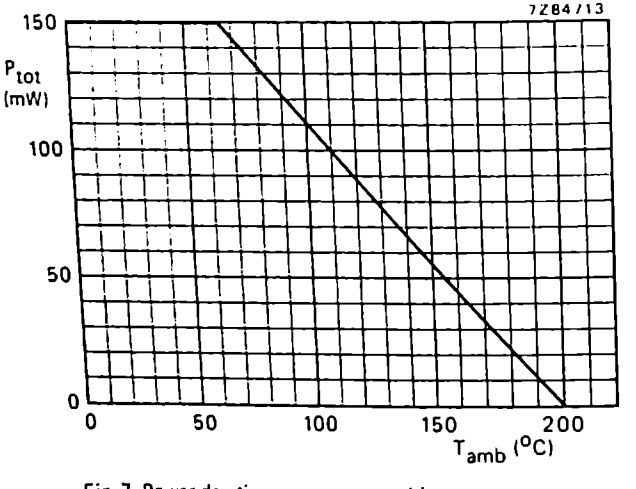


Fig. 7 Power derating curve versus ambient temperature.

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a subminiature plastic transfer-moulded T-package. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

N-P-N complements are BFR91 and BFR91A.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 °C
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz $-I_C$ 2 mA; $-V_{CE}$ 5 V	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz	F	typ.	2,4 dB

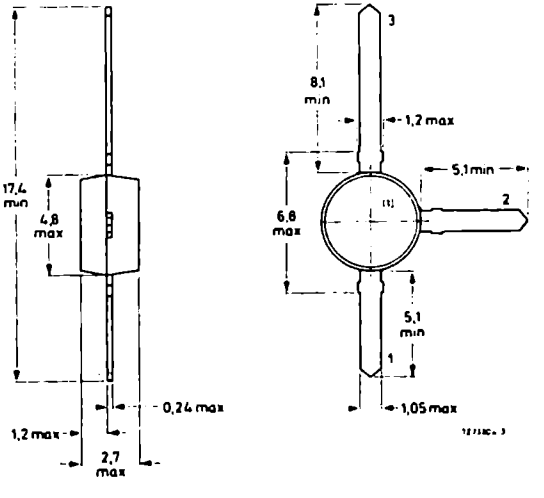
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Collector current (peak value) at f > 1 MHz	$-I_{CM}$	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		−65 to + 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0,5 °C/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; $-V_{CB}$ = 5 V	$-I_{CBO}$	<	50 nA
D.C. current gain $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	h_{FE}	>	20 *
Transition frequency f = 500 MHz; $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5 GHz *
Collector capacitance f = 1 MHz; $I_E = I_e$ = 0; $-V_{CB}$ = 5 V	C_c	typ.	0,85 pF
Emitter capacitance f = 1 MHz; $I_C = I_c$ = 0; $-V_{EB}$ = 0,5 V	C_e	typ.	1,8 pF
Feedback capacitance f = 1 MHz; $-I_C$ = 2 mA; $-V_{CE}$ = 5 V	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz	F	typ.	2,4 dB
Maximum unilateral power gain s_{re} assumed to be zero $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; f = 500 MHz			

$$10 \log \frac{|s_{fe}|^2}{(1-|s_{ie}|^2)(1-|s_{oe}|^2)} = G_{UM}$$ typ. 16,5 dB

* Measured under pulse conditions.

Intermodulation distortion* (see Fig. 2)

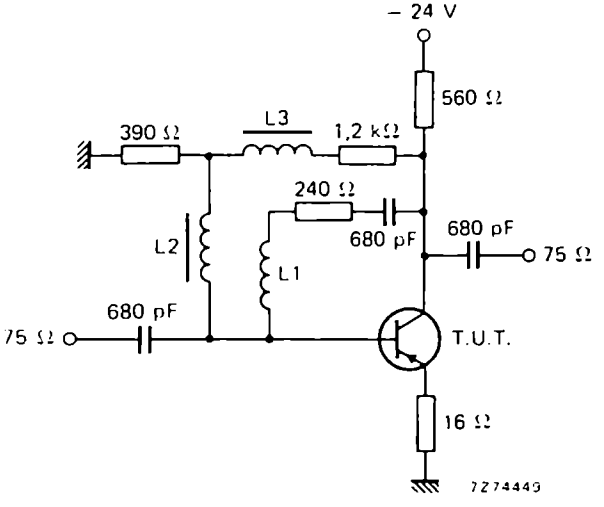
$-I_C$ = 30 mA; $-V_{CE}$ = 5 V; R_L = 75 Ω; VSWR < 2

$V_p = V_o$ = 300 mV at f_p = 495,25 MHz

$V_q = V_o - 6$ dB at f_q = 503,25 MHz

$V_r = V_o - 6$ dB at f_r = 505,25 MHz

Measured at $f_{(p+q-r)}$ = 493,25 MHz d_{im} typ. −60 dB



L1: 4 turns Cu wire (0,35); winding pitch 1 mm; internal diameter 4 mm.
L2 and L3: 5 μH (code number 3122 108 20150)

Fig. 2 Intermodulation distortion test circuit.

* Measured under pulse conditions.

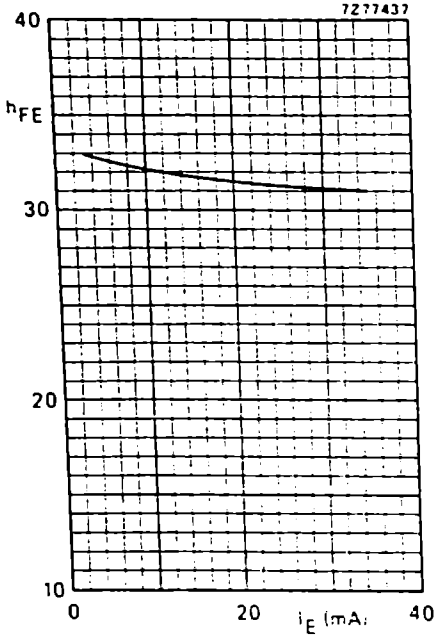


Fig. 3 Typical values; V_{CB} = 4 V.

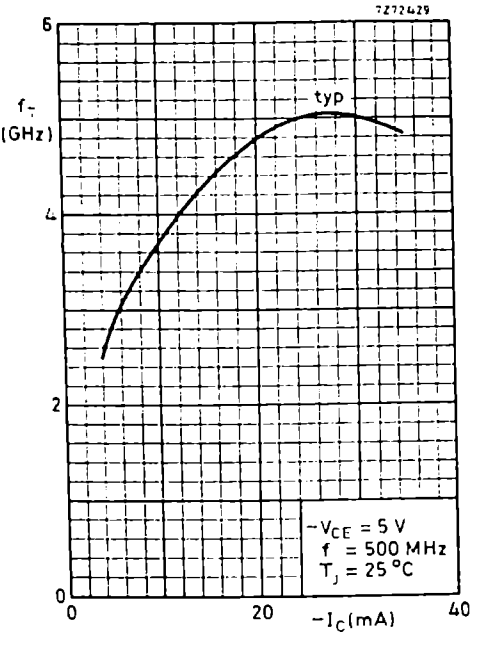


Fig. 4.

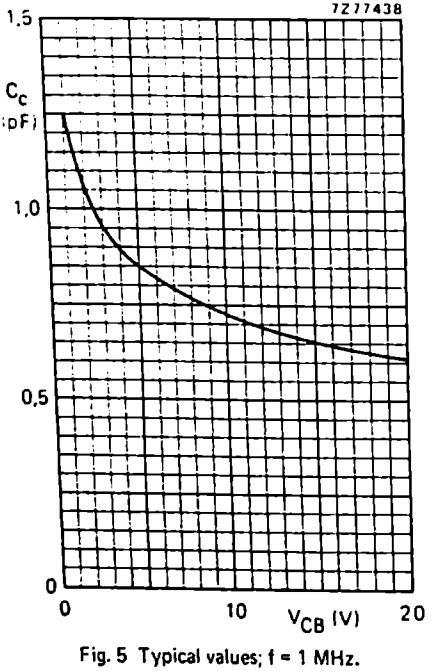


Fig. 5 Typical values; f = 1 MHz.

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complement is BFQ22S.

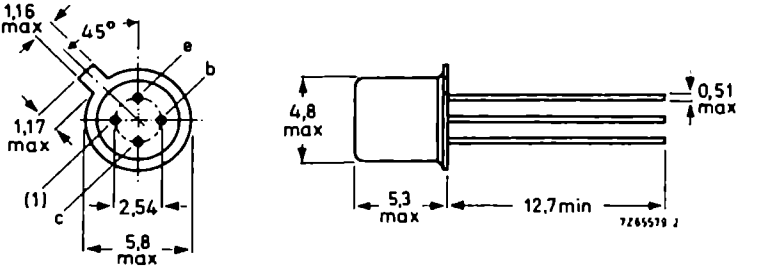
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4 dB
Maximum unilateral power gain (see page 2) $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Collector current (peak value) at $f > 1$ MHz	$-I_{CM}$	max.	50 mA
Total power dissipation up to $T_{amb} = 65$ °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,9 K/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0,6 K/mW

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current $I_E = 0$; $-V_{CB} = 5$ V	$-I_{CBO}$	<	50 nA
D.C. current gain (note 1) $-I_C = 30$ mA; $-V_{CE} = 5$ V	h_{FE}	> typ.	20 50
Transition frequency (notes 1 and 2) $-I_C = 30$ mA; $-V_{CE} = 5$ V; $f = 500$ MHz	f_T	typ.	5 GHz
Collector capacitance (note 3) $I_E = I_e = 0$; $-V_{CB} = 5$ V; $f = 1$ MHz	C_c	typ.	1,2 pF
Emitter capacitance $I_C = I_c = 0$; $-V_{EB} = 0{,}5$ V; $f = 1$ MHz	C_e	typ.	2,5 pF
Feedback capacitance (note 2) $I_C = 0$; $-V_{CE} = 5$ V; $f = 1$ MHz; $T_{amb} = 25$ °C	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance (note 2) $-I_C = 2$ mA; $-V_{CE} = 5$ V; $f = 500$ MHz; $T_{amb} = 25$ °C	F	typ.	2,4 dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero G_{UM} (in dB) $= 10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ $-I_C = 30$ mA; $-V_{CE} = 5$ V; $f = 500$ MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	15,0 dB

Notes
1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead not connected.

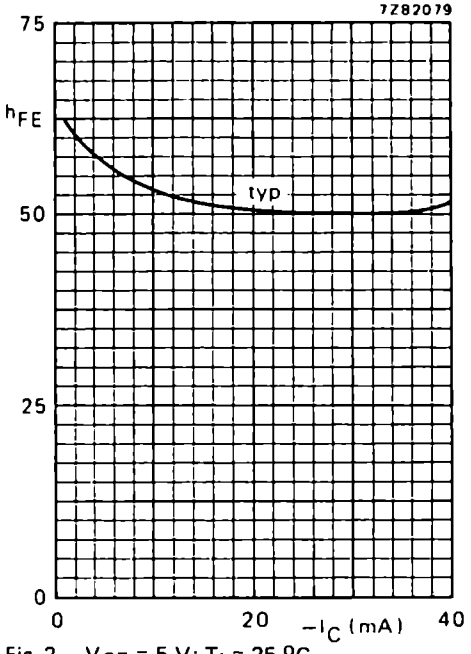


Fig. 2 $-V_{CE}$ = 5 V; T_j = 25 °C.

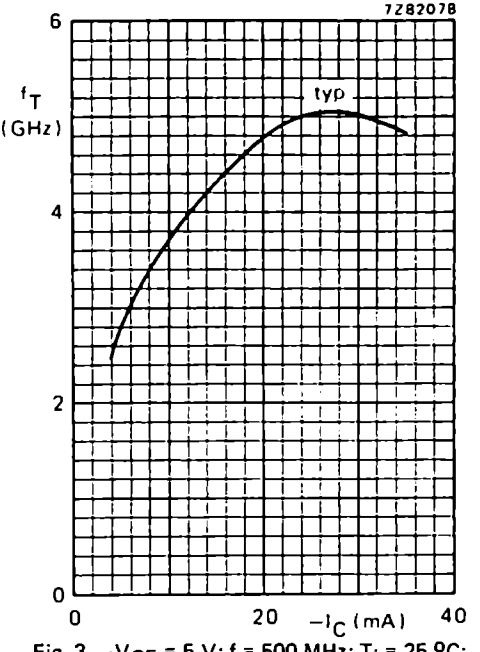


Fig. 3 $-V_{CE}$ = 5 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

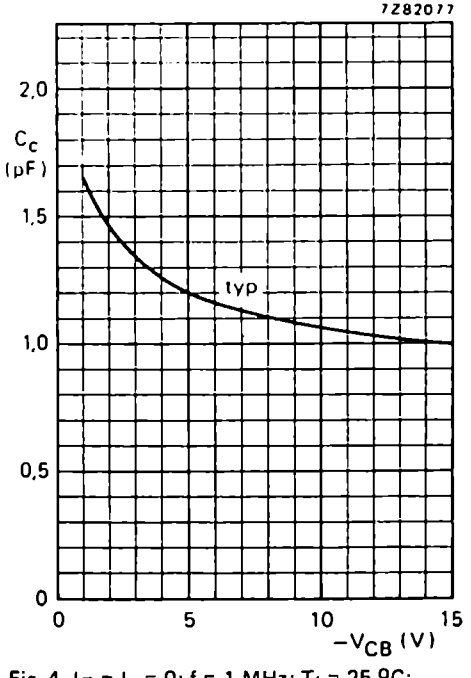


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C; shield lead not connected.

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a subminiature plastic transfer-moulded T-package.

It is intended for use in u.h.f. applications such as broadband aerial amplifiers (30 MHz to 860 MHz) and in microwave amplifiers such as radar systems, spectrum analysers etc.

The BFQ32 offers a high transition frequency and a low intermodulation distortion figure over a wide current range.

QUICK REFERENCE DATA

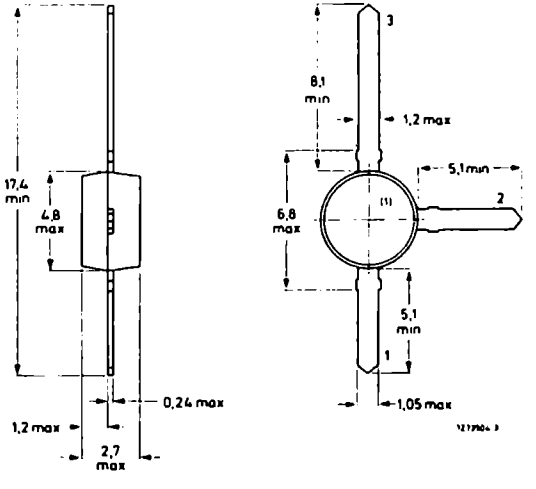
Collector-base voltage (open emitter)	$-V_{CBO}$	max	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max	15 V
Collector current (d.c.)	$-I_C$	max	75 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max	500 mW
Junction temperature	T_j	max	175 °C
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	>	3,6 GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 10 mA; $-V_{CE}$ = 10 V	C_{re}	<	1,4 pF
Noise figure at optimum source impedance $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ	3,75 dB
Intermodulation distortion at T_{amb} = 25 °C $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω; V_o = 500 mV $f_{(p+q-r)}$ = 493,25 MHz (see page 4)	d_{im}	typ	−60 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections
1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max	3 V
Collector current (d.c.)	$-I_C$	max	75 mA
Collector current (peak value); $f > 1$ MHz	$-I_{CM}$	max	150 mA
Total power dissipation up to $T_{amb} = 60$ °C mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	P_{tot}		500 mW
Storage temperature	T_{stg}		−65 to + 175 °C
Junction temperature	T_j	max	175 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0,23 °C/mW

CHARACTERISTICS

$T_{amb} = 25$ °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	<	100 nA
D.C. current gain *			
$-I_C = 50$ mA; $-V_{CE} = 10$ V	h_{FE}	>	20
$-I_C = 75$ mA; $-V_{CE} = 10$ V	h_{FE}	>	20
Transition frequency at $f = 500$ MHz *			
$-I_C = 50$ mA; $-V_{CE} = 10$ V	f_T	>	3,6 GHz
		typ	4,2 GHz
$-I_C = 75$ mA; $-V_{CE} = 10$ V	f_T	>	4,0 GHz
		typ	4,6 GHz
Collector capacitance at $f = 1$ MHz			
$I_E = I_e = 0$; $-V_{CB} = 10$ V	C_c	typ	1,3 pF
Emitter capacitance at $f = 1$ MHz			
$I_C = I_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	typ	6 pF
Feedback capacitance at $f = 1$ MHz			
$-I_C = 10$ mA; $-V_{CE} = 10$ V	C_{re}	<	1,4 pF
		typ	1,25 pF

* Measured under pulse conditions.

Noise figure at optimum source impedance

$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz — F typ 3,75 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{(1-|s_{ie}|^2)(1-|s_{oe}|^2)}$$

$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz — G_{UM} typ 14 dB

Intermodulation distortion (see fig. 1)

$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω

$V_p = V_o$ = 500 mV at f_p = 495,25 MHz
$V_q = V_o$ −6 dB at f_q = 503,25 MHz
$V_r = V_o$ −6 dB at f_r = 505,25 MHz

Measured at $f_{(p+q-r)}$ = 493,25 MHz — d_{im} typ −60 dB

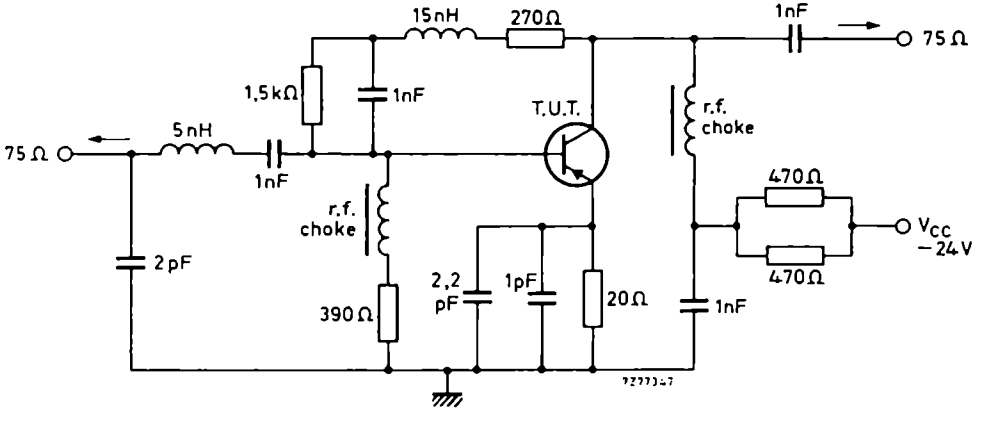
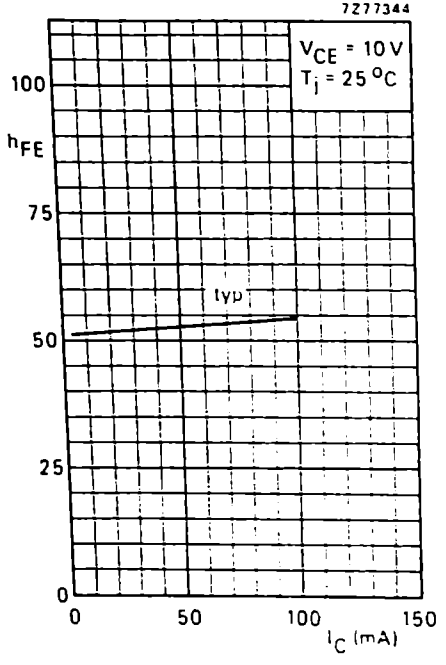
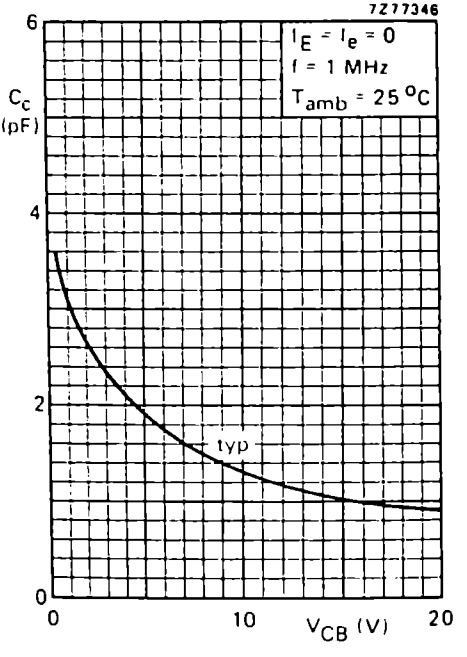
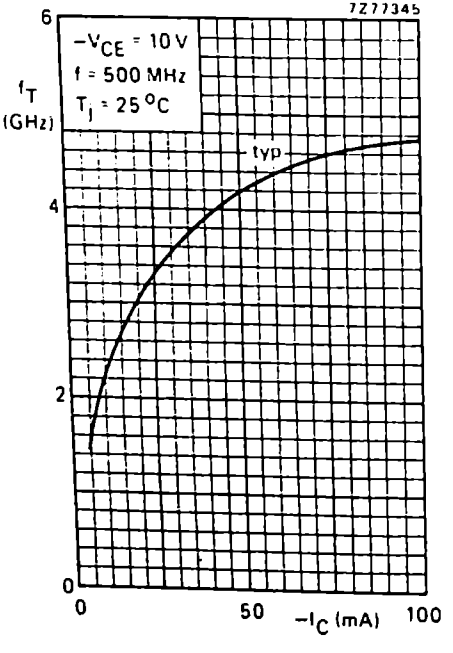


Fig. 1 Intermodulation test circuit.


7Z77344
V_{CE} = 10 V
T_j = 25 °C
h_{FE}
100
75
50
25
0
typ
0
50
100
150
I_C (mA)


7Z77346
$I_E = I_e = 0$
f = 1 MHz
T_{amb} = 25 °C
C_c (pF)
6
4
2
0
typ
0
10
20
V_{CB} (V)


7Z77345
$-V_{CE}$ = 10 V
f = 500 MHz
T_j = 25 °C
f_T (GHz)
6
4
2
0
typ
0
50
100
$-I_C$ (mA)

N-P-N MICROWAVE TRANSISTOR

The BFQ33 is a small-signal silicon planar epitaxial transistor in a miniature hermetically sealed microstripline encapsulation, featuring an extremely high transition frequency and very low noise up to high frequencies.

It is primarily intended for use in microwave amplifier applications.

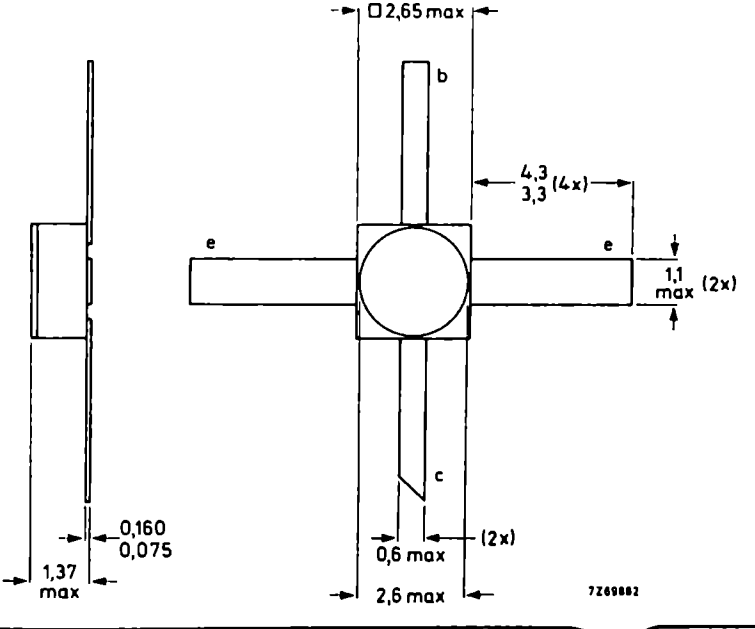
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	9 V
Collector-emitter voltage (open base)	V_{CEO}	max.	7 V
Collector current (d.c.)	I_C	max.	20 mA
Total power dissipation up to T_{amb} = 80 °C	P_{tot}	max.	140 mW
Transition frequency at f = 1,5 GHz I_C = 14 mA; V_{CE} = 5 V	f_T	typ.	12 GHz
Noise figure at optimum source impedance I_C = 5 mA; V_{CE} = 5 V; f = 2 GHz	F	typ.	2,5 dB
Maximum unilateral power gain (see page 3) I_C = 14 mA; V_{CE} = 5 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	13,7 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-100.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	9 V
Collector-emitter voltage (open base)	V_{CEO}	max.	7 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	20 mA
Total power dissipation up to T_{amb} = 80 °C	P_{tot}	max.	140 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	500 K/W*

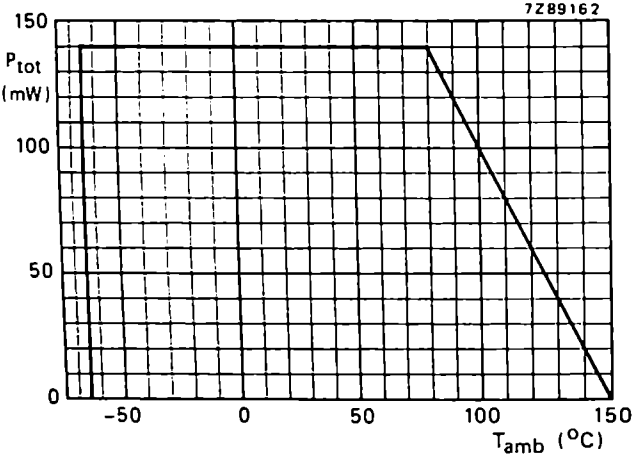


Fig. 2 Power derating curve versus ambient temperature.

* K/W is SI unit for °C/W.

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50 nA
D.C. current gain *			
I_C = 14 mA; V_{CE} = 5 V	h_{FE}	>	25
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 5 V	C_c	typ.	0,45 pF
Feedback capacitance at f = 1 MHz			
I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0,2 pF
Transition frequency at f = 1,5 GHz *			
I_C = 14 mA; V_{CE} = 5 V	f_T	typ.	12 GHz
Noise figure at optimum source impedance			
I_C = 5 mA; V_{CE} = 5 V; f = 2 GHz	F	typ.	2,5 dB
I_C = 5 mA; V_{CE} = 5 V; f = 4 GHz	F	typ.	3,8 dB
Maximum unilateral power gain (s_{re} assumed to be zero)			
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$			
I_C = 14 mA; V_{CE} = 5 V; f = 2 GHz	G_{UM}	typ.	13,7 dB
I_C = 14 mA; V_{CE} = 5 V; f = 4 GHz	G_{UM}	typ.	7,4 dB
s-parameters (common emitter)			
I_C = 14 mA; V_{CE} = 5 V; $R_S = R_L$ = 50 Ω; f = 2 GHz			
Input reflection coefficient	s_{ie}	typ.	0,18/−155°
Reverse transmission coefficient	s_{re}	typ.	0,10/ +49°
Forward transmission coefficient	s_{fe}	typ.	4,3 / +75°
Output reflection coefficient	s_{oe}	typ.	0,43/ −56°
I_C = 14 mA; V_{CE} = 5 V; $R_S = R_L$ = 50 Ω; f = 4 GHz			
Input reflection coefficient	s_{ie}	typ.	0,19/+171°
Reverse transmission coefficient	s_{re}	typ.	0,14/ +34°
Forward transmission coefficient	s_{fe}	typ.	2,0 / +48°
Output reflection coefficient	s_{oe}	typ.	0,50/ −89°

* Measured under pulse conditions.

Conditions for Figs 3 and 4:

V_{CE} = 5 V; I_C = 14 mA;
T_{amb} = 25 °C.

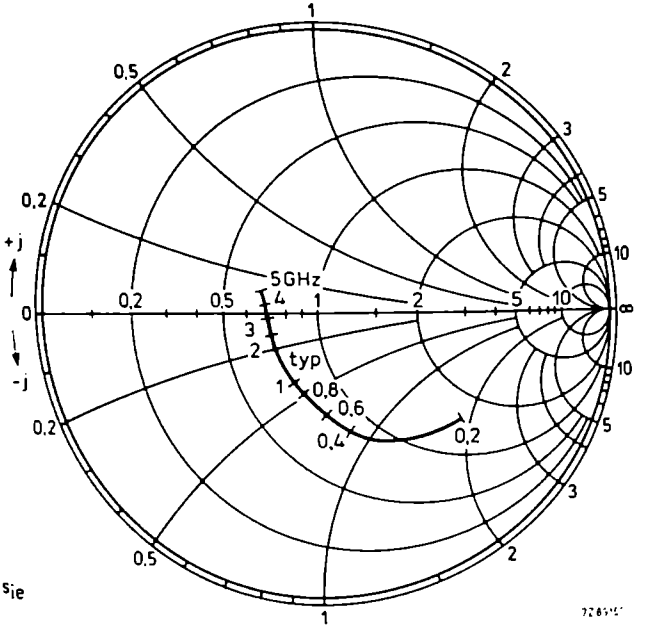


Fig. 3 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

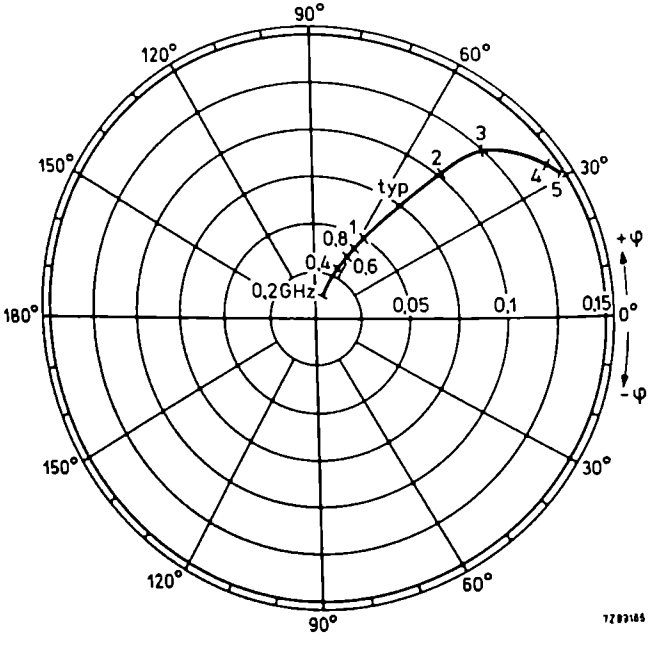


Fig. 4 Reverse transmission coefficient s_{re}.

Conditions for Figs 5 and 6:

V_{CE} = 5 V; I_C = 14 mA;
T_{amb} = 25 °C.

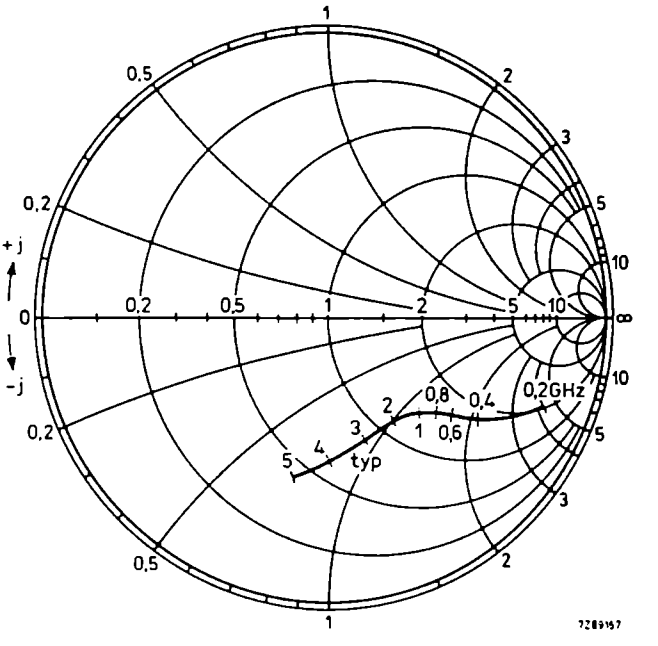


Fig. 5 Output impedance derived from output reflection coefficient s_{oe} co ordinates in ohm x 50.

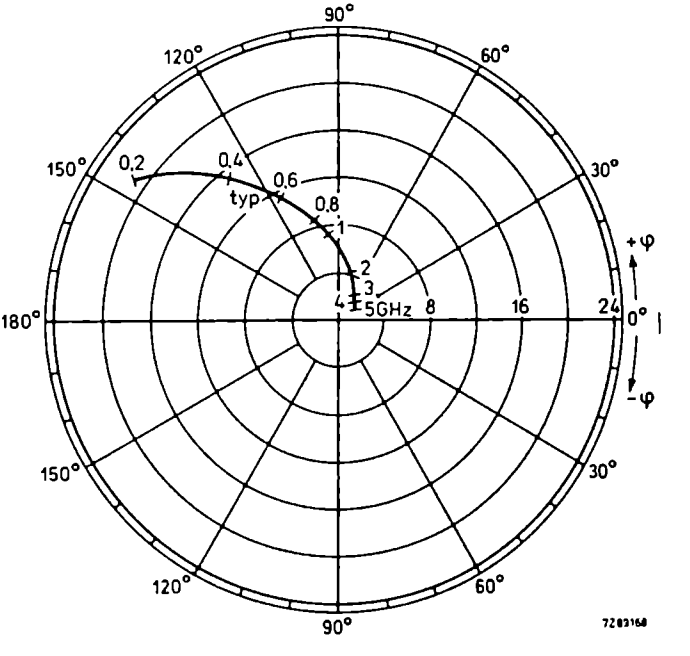


Fig. 6 Forward transmission coefficient s_{fe}.

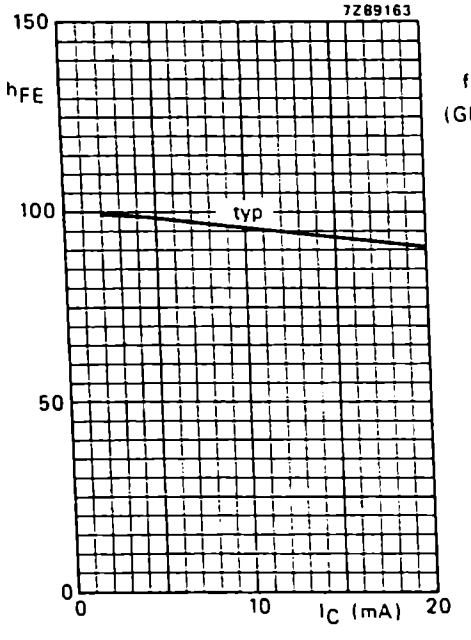


Fig. 7 V_{CE} = 5 V; T_j = 25 °C.

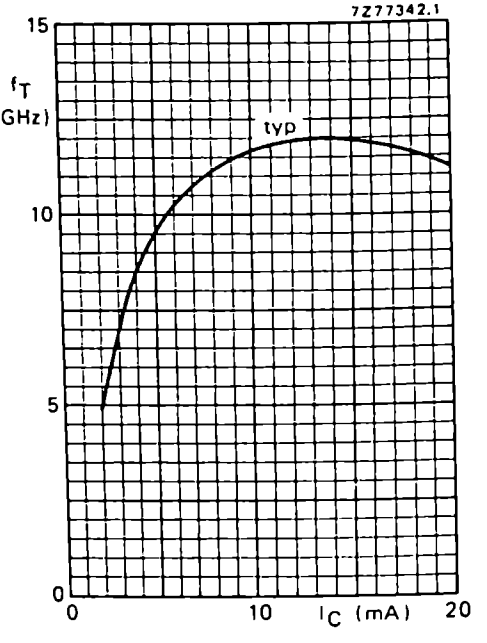


Fig. 8 V_{CE} = 5 V; f = 1,5 GHz; T_j = 25 °C.

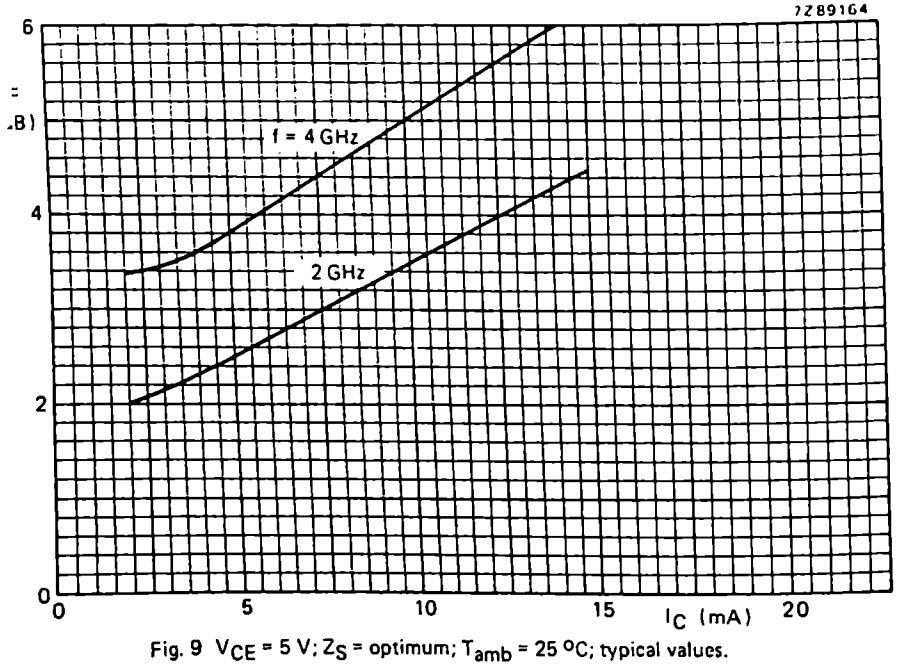


Fig. 9 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor primarily intended for driver and final stages in MATV system amplifiers. This device is also suitable for use in low power band IV and V equipment. Diffused emitter ballasting resistors and the application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

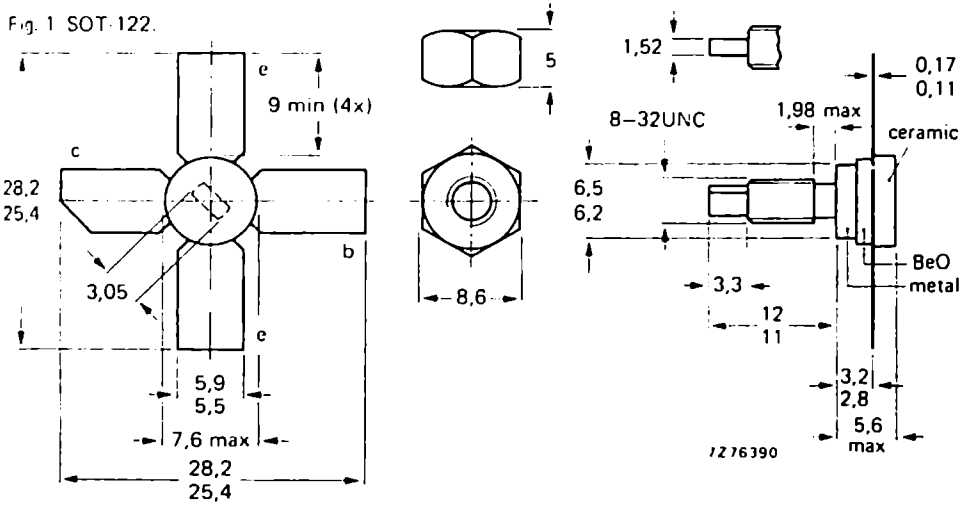
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation (d.c.) up to T_{mb} = 125 °C	P_{tot}	max.	2,25 W
Operating junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 150 mA; V_{CE} = 15 V; T_j = 25 °C	f_T	>	3,5 GHz
Output voltage at d_{im} = −60 dB (see Figs 2 and 4) I_C = 120 mA; V_{CE} = 15 V, R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	1,2 V

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base) (see Fig. 3)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation (d.c.) up to T_{mb} = 125 °C (see Fig. 3)	P_{tot}	max.	2,25 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	15,0 K/W*
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W*

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 15 V	I_{CBO}	<	100 μA
D.C. current gain**			
I_C = 75 mA; V_{CE} = 15 V	h_{FE}	>	25
I_C = 150 mA; V_{CE} = 15 V	h_{FE}	>	25
Transition frequency at f = 500 MHz**			
I_C = 75 mA; V_{CE} = 15 V	f_T	>	3,0 GHz
		typ.	3,5 GHz
I_C = 150 mA; V_{CE} = 15 V	f_T	>	3,5 GHz
		typ.	4,0 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 15 V	C_c	typ.	2,0 pF
		<	2,75 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	11 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 15 V	C_{re}	typ.	1,0 pF
		<	1,35 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF
Noise figure measured in MATV test circuit (see Fig. 2)			
I_C = 120 mA; V_{CE} = 15 V; f = 500 MHz	F	typ.	8 dB
Maximum unilateral power gain (s_{re} assumed to be zero)			
$G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$			
I_C = 120 mA; V_{CE} = 15 V; f = 500 MHz	G_{UM}	typ.	16,3 dB

* K/W is SI unit for °C/W.

** Measured under pulse conditions.

Output voltage at d_{im} = −60 dB (see Figs 2 and 4)
(DIN 45004B, par. 6.3: 3-tone)
I_C = 120 mA; V_{CE} = 15 V; R_L = 75 Ω

$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz
$V_q = V_o$ −6 dB ; f_q = 803,25 MHz
$V_r = V_o$ −6 dB ; f_r = 805,25 MHz
measured at $f_{(p+q-r)}$ = 793,25 MHz

V_o typ. 1,2 V

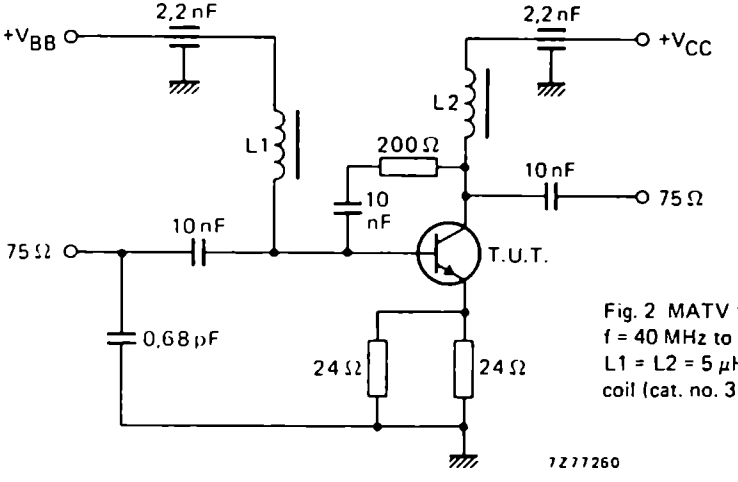


Fig. 2 MATV test circuit
f = 40 MHz to 860 MHz.
L1 = L2 = 5 μH Ferroxcube coil (cat. no. 3122 108 20153).

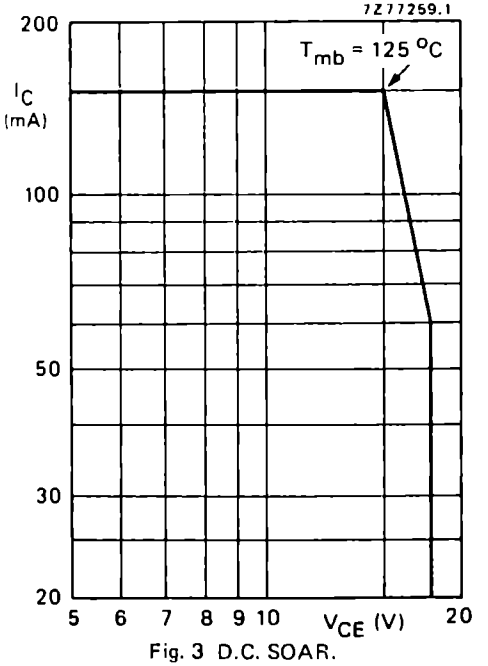


Fig. 3 D.C. SOAR.

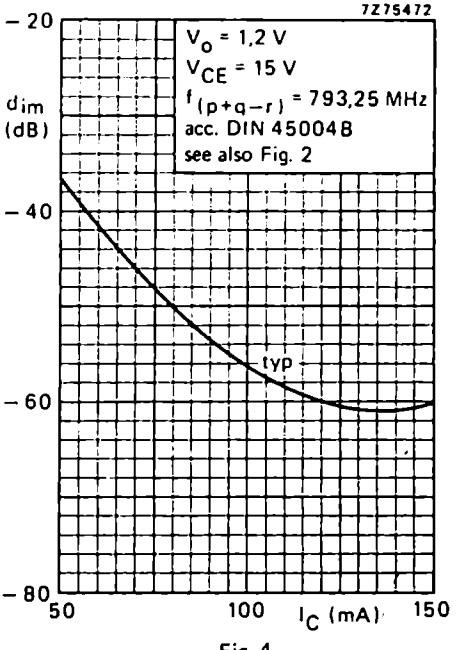


Fig. 4.

s-parameters (common emitter) at V_{CE} = 7,5 V.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
50	40	0,47/ −72°	0,02/64°	30,5/147°	0,85/ −34°
	200	0,55/−154°	0,06/52°	11,3/101°	0,36/ −84°
	500	0,54/+ 177°	0,08/58°	4,9/ 78°	0,25/−104°
	800	0,52/+ 160°	0,12/58°	3,2/ 63°	0,25/−113°
	1000	0,50/+ 150°	0,15/57°	2,6/ 54°	0,26/−118°
	1200	0,48/+ 142°	0,18/54°	2,2/ 46°	0,28/−122°
75	40	0,45/ −76°	0,02/64°	32,1/144°	0,83/ −36°
	200	0,54/−156°	0,05/53°	11,6/100°	0,35/ −90°
	500	0,54/+ 176°	0,08/59°	5,0/ 78°	0,24/−112°
	800	0,51/+ 160°	0,13/59°	3,3/ 63°	0,24/−121°
	1000	0,49/+ 150°	0,16/57°	2,7/ 55°	0,24/−124°
	1200	0,46/+ 142°	0,18/54°	2,3/ 47°	0,26/−128°
100	40	0,44/ −79°	0,02/63°	33,0/145°	0,82/ −37°
	200	0,54/−157°	0,06/54°	11,8/100°	0,35/ −93°
	500	0,53/+ 175°	0,09/60°	5,1/ 78°	0,23/−117°
	800	0,51/+ 159°	0,13/59°	3,3/ 64°	0,23/−126°
	1000	0,49/+ 150°	0,16/57°	2,7/ 55°	0,24/−129°
	1200	0,46/+ 142°	0,19/54°	2,3/ 47°	0,26/−131°
120	40	0,43/ −81°	0,02/63°	33,5/145°	0,82/ −38°
	200	0,54/−157°	0,05/55°	11,9/ 99°	0,35/ −95°
	500	0,53/+ 175°	0,09/60°	5,1/ 77°	0,23/−119°
	800	0,51/+ 159°	0,13/59°	3,3/ 63°	0,23/−128°
	1000	0,48/+ 149°	0,16/56°	2,7/ 55°	0,24/−131°
	1200	0,46/+ 141°	0,19/53°	2,3/ 47°	0,25/−132°
150	40	0,43/ −82°	0,02/63°	33,6/145°	0,81/ −39°
	200	0,54/−158°	0,05/55°	11,8/ 99°	0,34/ −96°
	500	0,53/+ 175°	0,09/60°	5,1/ 77°	0,23/−121°
	800	0,51/+ 159°	0,13/59°	3,3/ 63°	0,23/−129°
	1000	0,49/+ 149°	0,16/56°	2,7/ 55°	0,24/−132°
	1200	0,47/+ 141°	0,19/53°	2,3/ 47°	0,25/−134°

s-parameters (common emitter) at V_{CE} = 15 V.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
50	40	0,48/ −65°	0,02/62°	31,0/148°	0,83/ −30°
	200	0,53/−149°	0,04/52°	12,0/102°	0,37/ −73°
	500	0,52/+ 179°	0,08/58°	5,2/ 78°	0,25/ −89°
	800	0,50/+ 162°	0,12/59°	3,4/ 64°	0,26/ −99°
	1000	0,47/+ 152°	0,14/57°	2,8/ 55°	0,28/−104°
	1200	0,45/+ 144°	0,17/55°	2,3/ 47°	0,31/−109°
75	40	0,46/ −68°	0,02/62°	32,9/148°	0,82/ −32°
	200	0,52/−151°	0,04/53°	12,5/101°	0,36/ −79°
	500	0,51/+ 178°	0,08/59°	5,4/ 78°	0,24/ −97°
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,24/−106°
	1000	0,46/+ 152°	0,15/57°	2,8/ 56°	0,26/−110°
	1200	0,44/+ 144°	0,17/55°	2,4/ 48°	0,28/−114°
100	40	0,47/ −69°	0,02/62°	33,9/147°	0,81/ −34°
	200	0,51/−151°	0,04/54°	12,6/101°	0,35/ −82°
	500	0,50/+ 178°	0,08/59°	5,5/ 78°	0,23/−101°
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,23/−109°
	1000	0,45/+ 152°	0,15/57°	2,9/ 56°	0,25/−113°
	1200	0,43/+ 144°	0,18/54°	2,4/ 48°	0,27/−117°
120	40	0,47/ −69°	0,02/62°	34,6/146°	0,81/ −34°
	200	0,51/−151°	0,04/54°	12,7/101°	0,35/ −83°
	500	0,50/+ 178°	0,08/60°	5,5/ 78°	0,23/−103°
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,23/−112°
	1000	0,45/+ 152°	0,15/57°	2,9/ 56°	0,24/−115°
	1200	0,43/+ 144°	0,18/54°	2,4/ 48°	0,26/−118°
150	40	0,49/ −70°	0,02/61°	34,8/146°	0,80/ −35°
	200	0,52/−152°	0,04/54°	12,6/100°	0,34/ −84°
	500	0,50/+ 178°	0,08/60°	5,4/ 78°	0,23/−103°
	800	0,48/+ 162°	0,12/59°	3,5/ 64°	0,23/−111°
	1000	0,46/+ 152°	0,15/57°	2,8/ 55°	0,24/−114°
	1200	0,44/+ 144°	0,18/54°	2,4/ 48°	0,27/−117°

Conditions for Figs 5 and 6:

V_{CE} = 15 V; I_C = 120 mA;
T_{amb} = 25 °C.

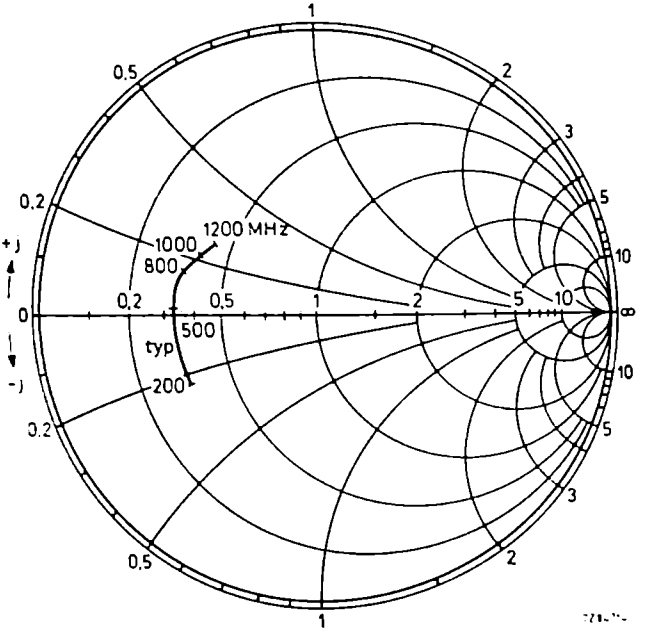


Fig. 5 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

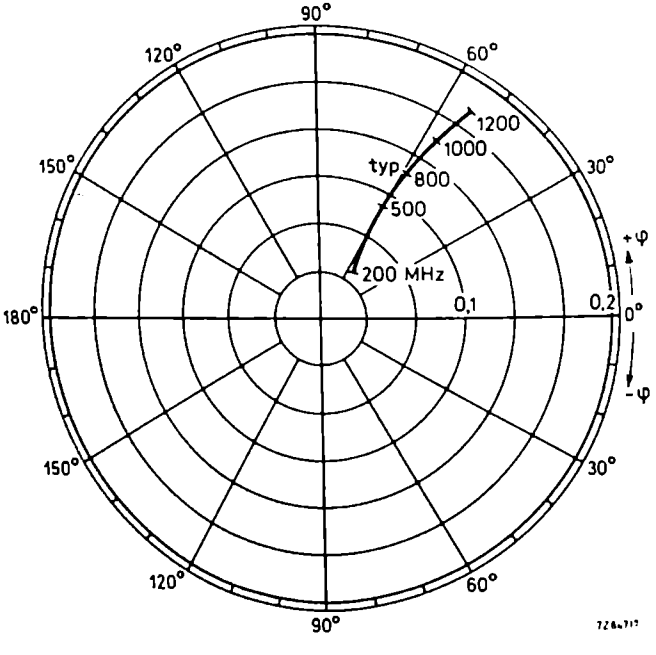


Fig. 6 Reverse transmission coefficient s_{re}.

Conditions for Figs 7 and 8:

V_{CE} = 15 V; I_C = 120 mA;
T_{amb} = 25 °C.

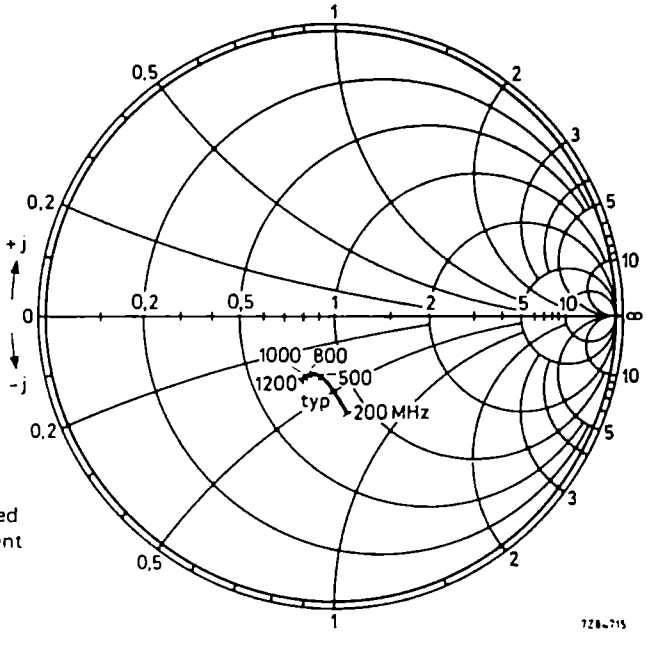


Fig. 7 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

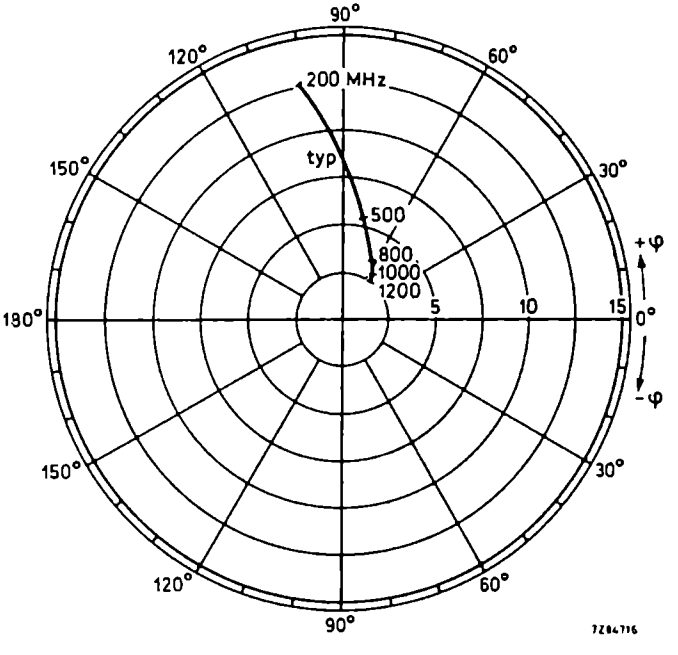


Fig. 8 Forward transmission coefficient s_{fe}.

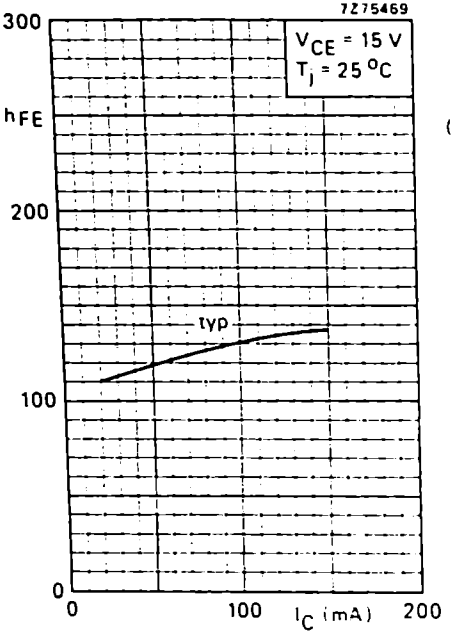


Fig. 9.

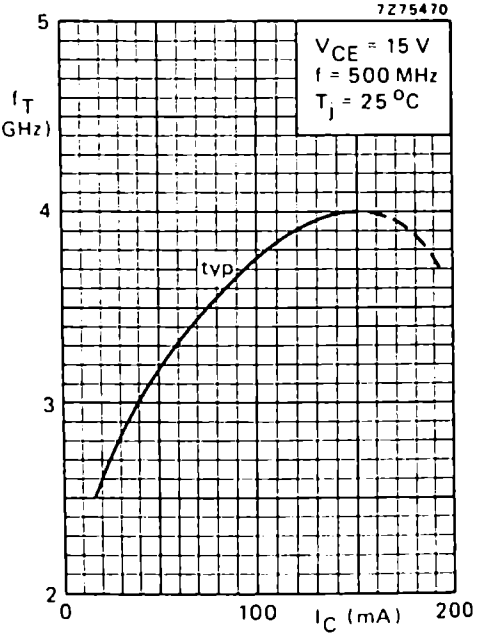


Fig. 10.

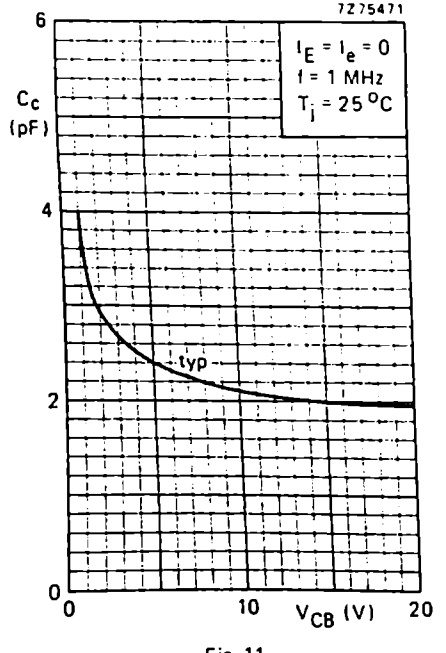


Fig. 11.

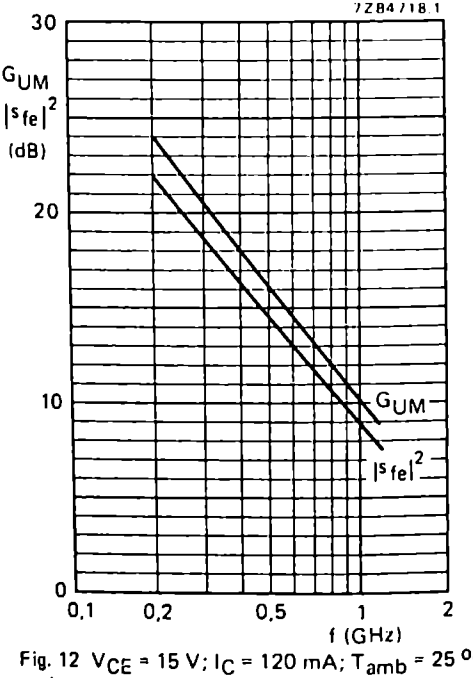


Fig. 12 V_{CE} = 15 V; I_C = 120 mA; T_{amb} = 25 °C; typical values.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in plastic T-package, intended for wideband amplification applications. The device features high output voltage capabilities.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{amb} = 45 °C	P_{tot}	max.	1 W
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3,7 GHz
Maximum power gain at f = 300 MHz, T_{amb} = 25 °C I_C = 100 mA; V_{CE} = 10 V	G_M	typ.	20 dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 100 mA, V_{CE} = 10 V; R_L = 75 Ω $f_{(p+q-r)}$ = 285,25 MHz; T_{amb} = 25 °C	V_O	typ.	1 V

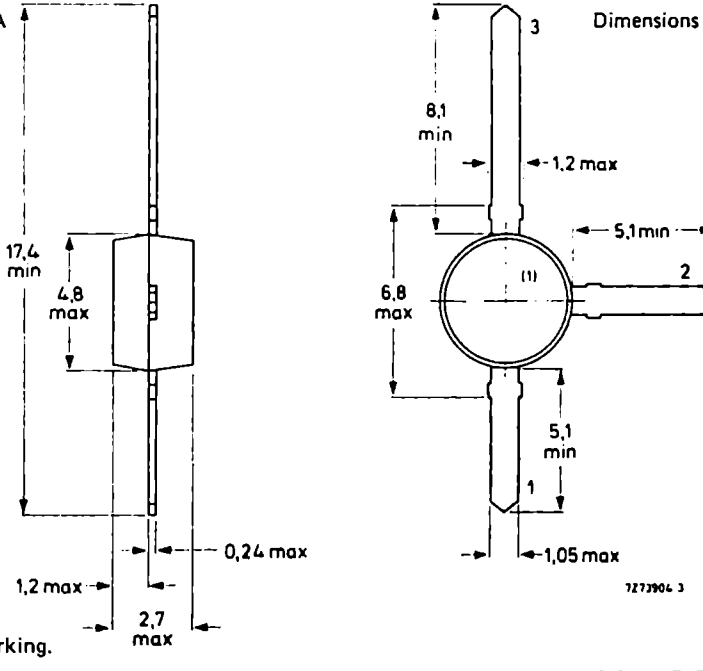
MECHANICAL DATA

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector

Dimensions in mm



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{amb} = 45 °C (see Fig. 2)	P_{tot}	max.	1 W
Storage temperature	T_{stg}	−65 to	+175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to case	$R_{th\ j\text{-}c}$	50 K/W*
From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2)	$R_{th\ j\text{-}a}$	130 K/W*

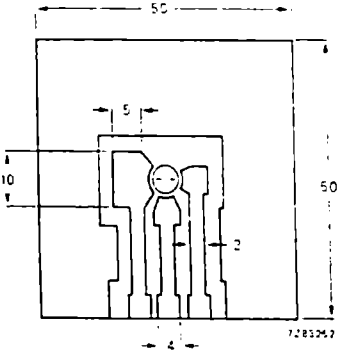


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)
Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

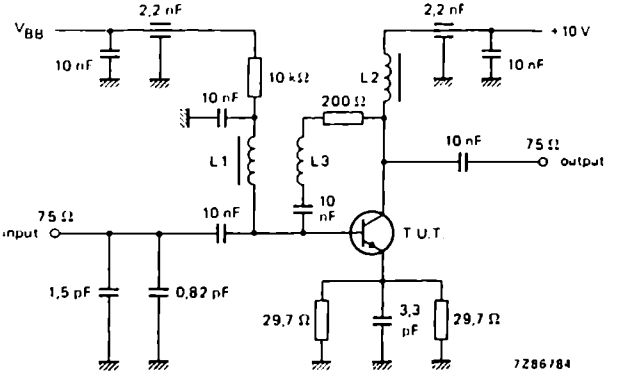
T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 15 V	I_{CBO}	max.	100 μA
D.C. current gain** I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz** I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3,7 GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	2,0 pF
Emitter capacitance at f = 1 MHz $I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	10 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	1,2 pF

* K/W is SI unit for °C/W.
** Measured under pulse conditions.

CHARACTERISTICS (continued)

Maximum power gain at f = 300 MHz I_C = 100 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_M	typ.	20 dB
Output voltage at d_{im} = −60 dB (see Fig. 3) (DIN 45004B); T_{amb} = 25 °C; I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω $V_p = V_o$ at d_{im} = −60 dB; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 295,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	typ.	1 V
Output voltage at d_{im} = −60 dB (see Fig. 3) (DIN 45004B); T_{amb} = 25 °C; I_C = 90 mA; V_{CE} = 10 V; R_L = 75 Ω $V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz $V_q = V_o$ −6 dB; f_q = 803,25 MHz $V_r = V_o$ −6 dB; f_r = 805,25 MHz Measured at $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	750 mV
Second harmonic distortion (see Fig. 3) I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C $V_p = V_o$ = 316 mV = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 316 mV = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	typ.	−55 dB



BFQ34T

Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L2 = 5 μH Ferroxcube choke.
L3 = 2 turns Cu wire (0,5 mm); internal diameter 4 mm; winding pitch 2 mm.

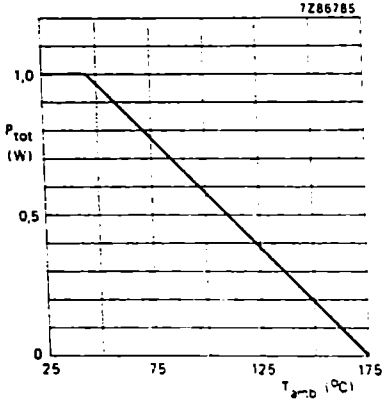


Fig. 4.

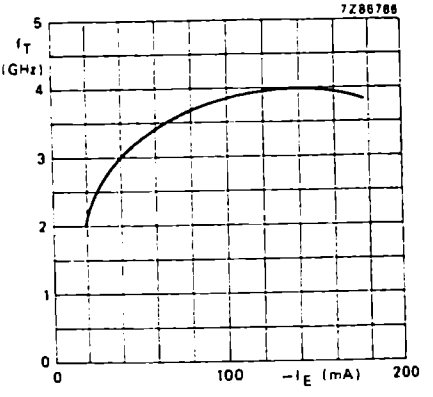


Fig. 5 V_{CE} = 10 V; f = 500 MHz.

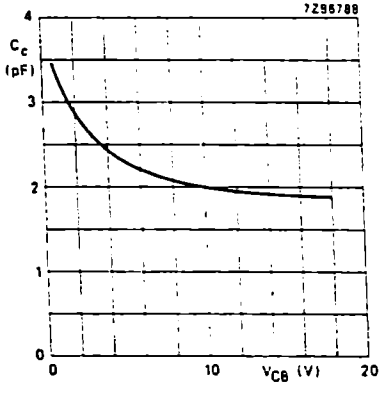


Fig. 6 I_E = 0; f = 1 MHz.

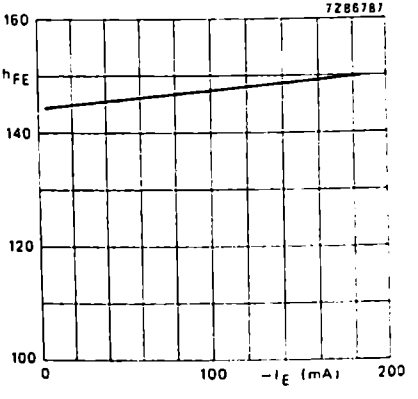


Fig. 7 V_{CE} = 10 V.

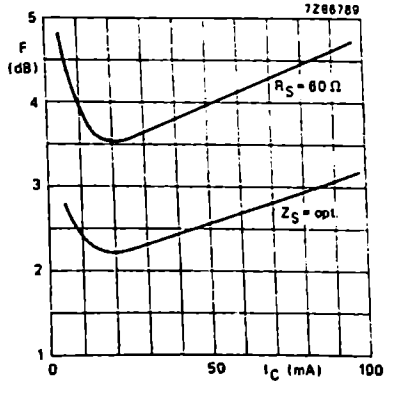


Fig. 8 V_{CE} = 10 V; f = 800 MHz.

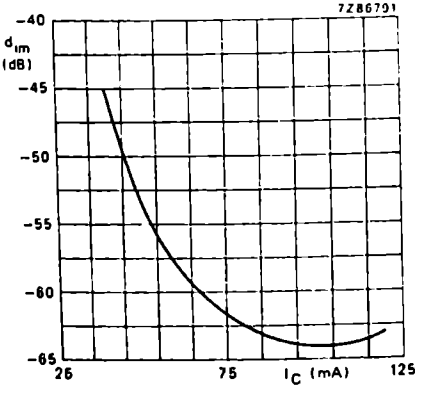


Fig. 9 V_{CE} = 10 V; V_o = 58 dBmV; $f_{(p+q-r)}$ = 285,25 MHz.

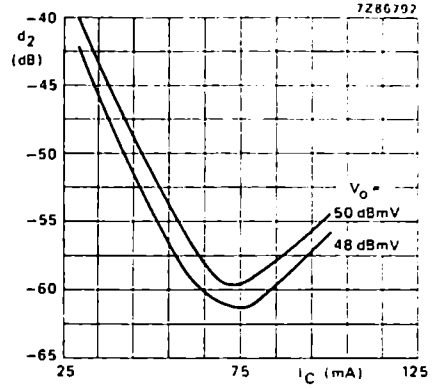


Fig. 10 V_{CE} = 10 V; f_p = 66 MHz; f_q = 144 MHz; $f_{(p+q)}$ = 210 MHz.

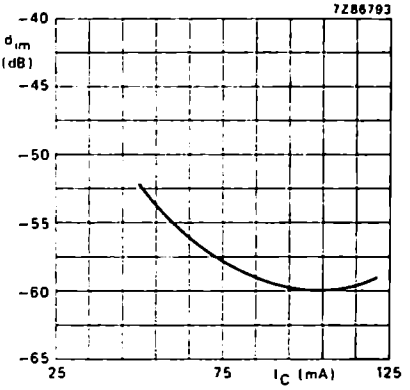


Fig. 11 V_{CE} = 10 V; V_o = 750 mV; $f_{(p+q-r)}$ = 793,24 MHz.

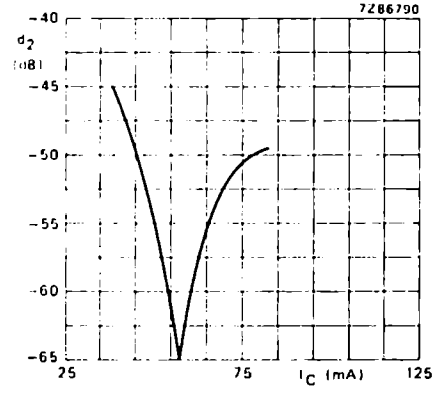


Fig. 12 V_{CE} = 10 V; V_o = 48 dBmV; f_p = 560 MHz; f_q = 250 MHz; $f_{(p+q)}$ = 810 MHz.

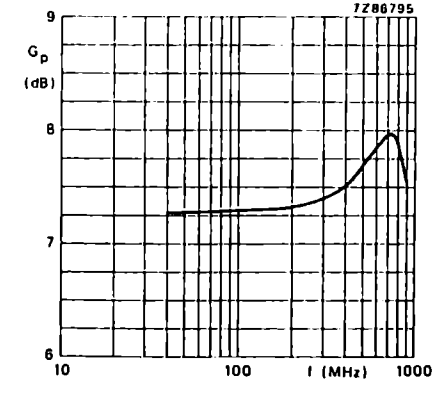


Fig. 13 Gain measured in test circuit (Fig. 3).

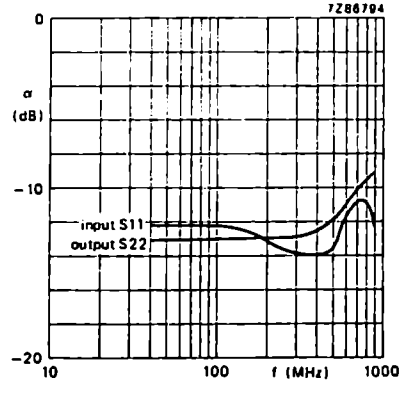


Fig. 14 Return losses measured in test circuit (Fig. 3).

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a subminiature plastic transfer-moulded T-package. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complements are BFR90 and BFR90A.

QUICK REFERENCE DATA

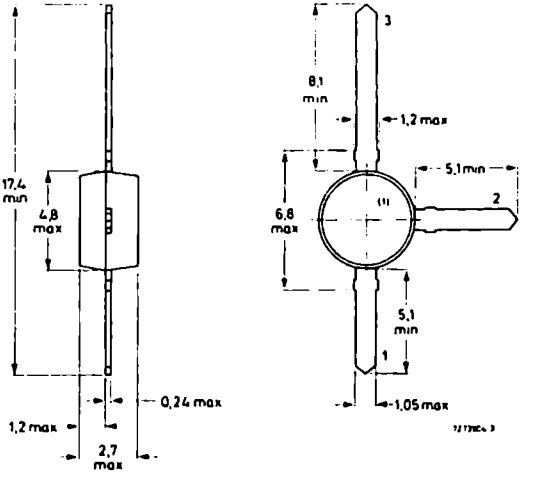
Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 °C
Transition frequency at f = 500 MHz $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections
1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Collector current (peak value) at f > 1 MHz	$-I_{CM}$	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}	−65 to +150 °C	
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0,5 K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; $-V_{CB}$ = 10 V	$-I_{CBO}$	<	50 nA
D.C. current gain* $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	h_{FE}	>	20
Transition frequency at f = 500 MHz* $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5 GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; $-V_{CB}$ = 10 V	C_c	typ.	0,65 pF
Emitter capacitance at f = 1 MHz $I_C = I_c$ = 0; $-V_{EB}$ = 0,5 V	C_e	typ.	1,2 pF
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7 dB
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	19,0 dB

* Measured under pulse conditions.

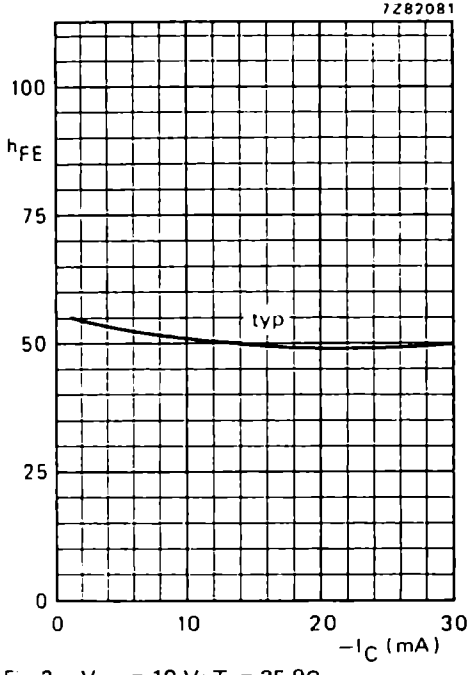


Fig. 2 $-V_{CE}$ = 10 V; T_j = 25 °C.

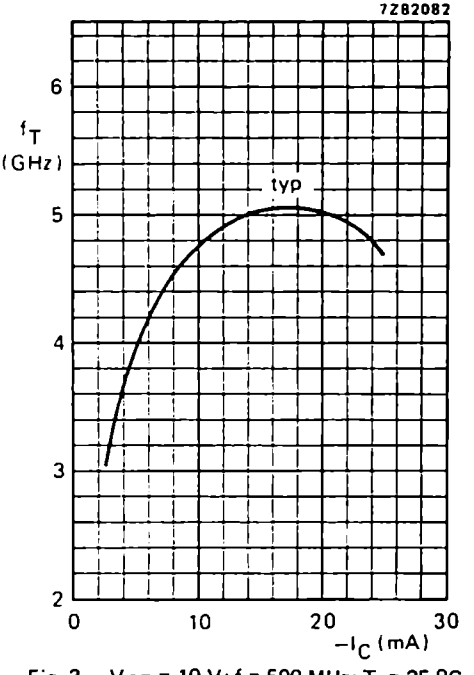


Fig. 3 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C.

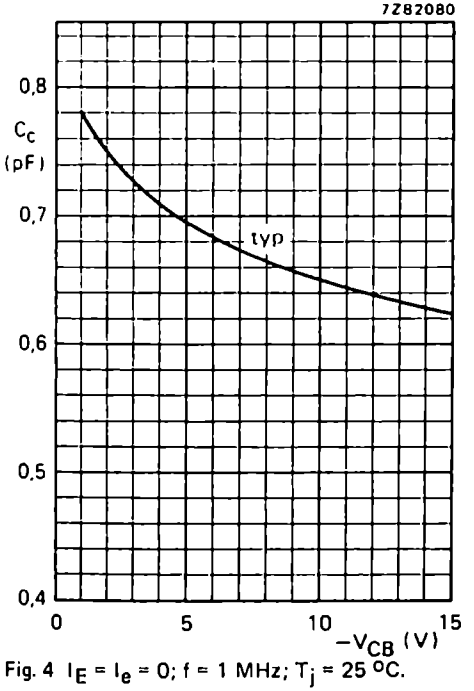


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C.

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complement is BFQ53.

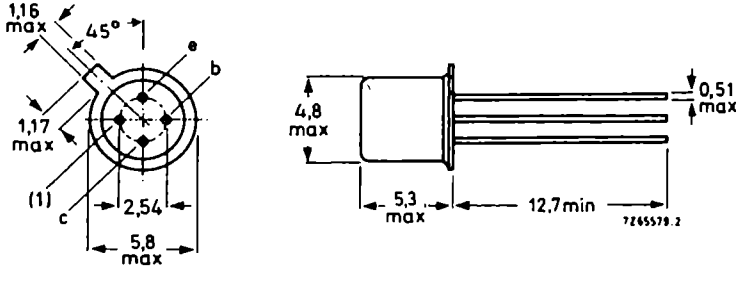
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,5 pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7 dB
Maximum unilateral power gain (see page 2) $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Collector current (peak value) at f > 1 MHz	$-I_{CM}$	max.	35 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,9 K/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0,6 K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; $-V_{CB}$ = 10 V	$-I_{CBO}$	<	50 nA
D.C. current gain (note 1) $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	h_{FE}	> typ.	20 50
Transition frequency (notes 1 and 2) $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz	f_T	typ.	5 GHz
Collector capacitance (note 3) $I_E = I_e$ = 0; $-V_{CB}$ = 10 V; f = 1 MHz	C_c	typ.	0,85 pF
Emitter capacitance $I_C = I_c$ = 0; $-V_{EB}$ = 0,5 V; f = 1 MHz	C_e	typ.	1,2 pF
Feedback capacitance (note 2) I_C = 0; $-V_{CE}$ = 10 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	0,5 pF
Noise figure at optimum source impedance (note 2) $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7 dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17,0 dB

Notes
1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead not connected.

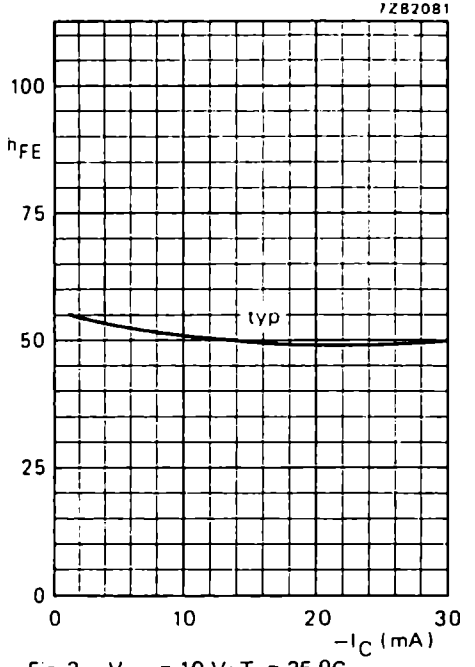


Fig. 2 $-V_{CE}$ = 10 V; T_j = 25 °C.

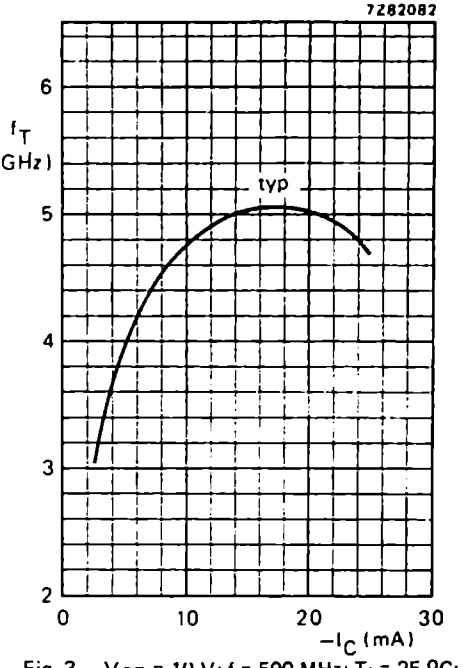


Fig. 3 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

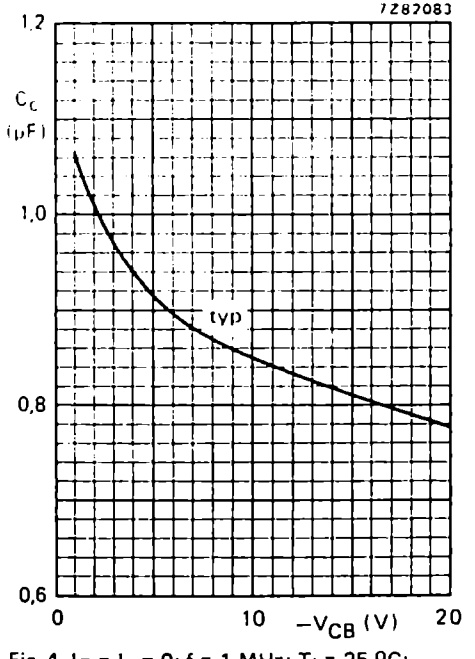


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C; shield lead not connected.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

P-N-P complement is BFQ52.

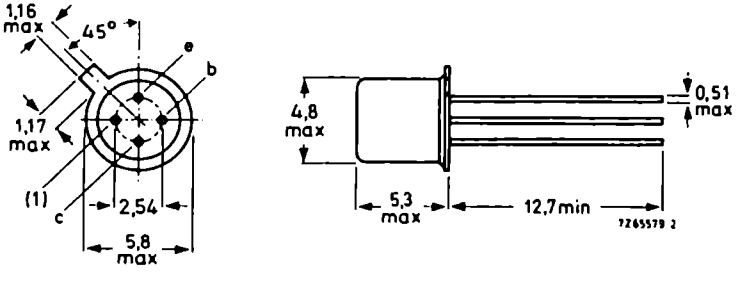
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4 dB
Maximum unilateral power gain (see page 2) I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value) at f > 1 MHz	I_{CM}	max.	35 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,9 K/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0,6 K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50 nA
D.C. current gain (note 1) I_C = 14 mA; V_{CE} = 10 V	h_{FE}	> typ.	25 50
Transition frequency (notes 1 and 2) I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz	f_T	typ.	5 GHz
Collector capacitance (note 3) $I_E = I_e$ = 0; V_{CB} = 10 V; f = 1 MHz	C_c	typ.	0,75 pF
Emitter capacitance $I_C = I_c$ = 0; V_{EB} = 0,5 V; f = 1 MHz	C_e	typ.	1,2 pF
Feedback capacitance (note 2) I_C = 0; V_{CE} = 10 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance (note 2) I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4 dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero $G_{UM}\ (\text{in dB}) = \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18,0 dB

Notes

1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead not connected.

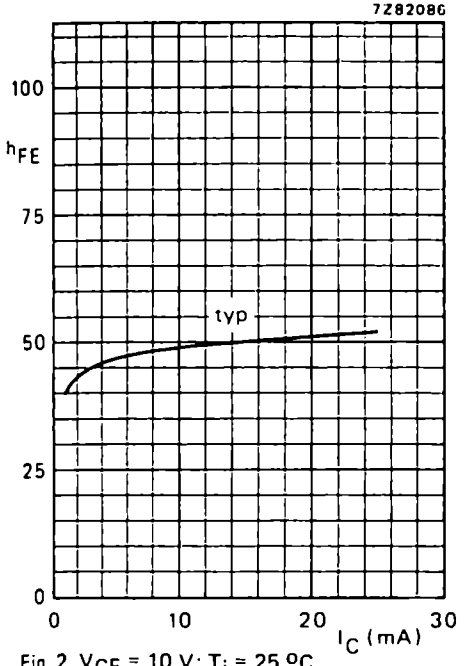


Fig. 2 V_{CE} = 10 V; T_j = 25 °C.

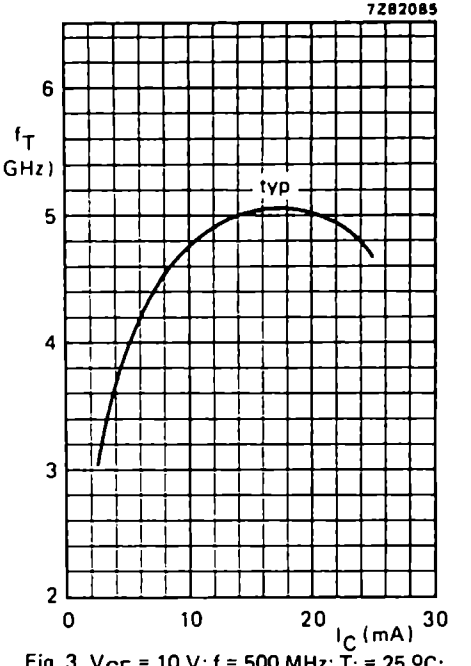


Fig. 3 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

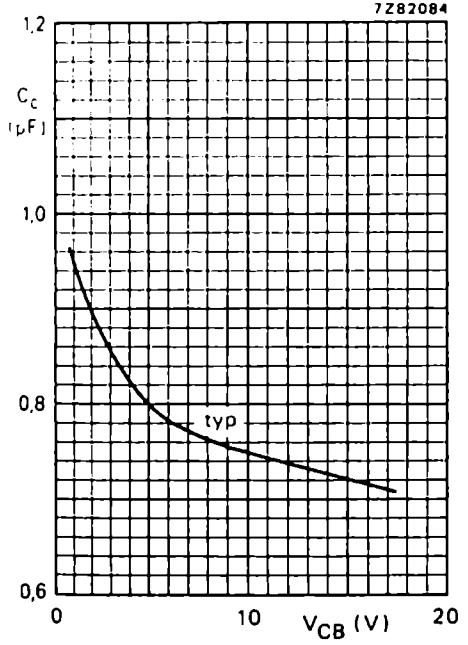


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C; shield lead not connected.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features the combination of high power gain, high transition frequency and low noise up to high frequencies.

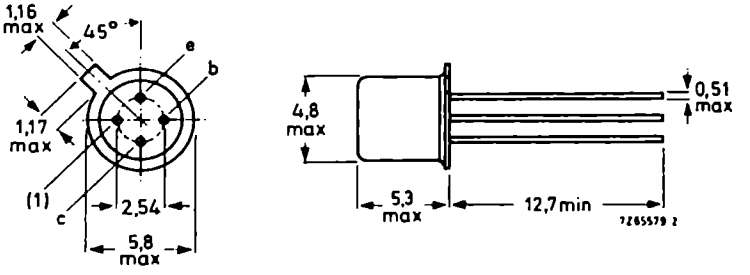
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	75 mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	250 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 5 V	f_T	typ.	4,5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1,0 pF
Noise figure at optimum source impedance I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	F	<	3,0 dB
Maximum unilateral power gain (see page 2) I_C = 20 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	>	17,5 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	75 mA
Collector current (peak value) at f > 1 MHz	I_{CM}	max.	150 mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		−65 to + 200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	600 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	<	100 nA
D.C. current gain (note 1) I_C = 20 mA; V_{CE} = 5 V	h_{FE}	> <	50 150
Transistion frequency (notes 1 and 2) I_C = 50 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	4,5 GHz
Collector capacitance (note 3) I_C = 0; V_{CB} = 5 V; f = 1 MHz	C_{cb}	typ.	1,3 pF
Feedback capacitance (note 2) I_C = 0; V_{CE} = 10 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ. <	1,0 pF 1,4 pF
Noise figure at optimum source impedance (note 2) I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	F	<	3,0 dB
I_C = 10 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,3 dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$			
I_C = 20 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	>	17,5 dB
I_C = 50 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5 dB

Notes
1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead and emitter lead connected to bridge earth.

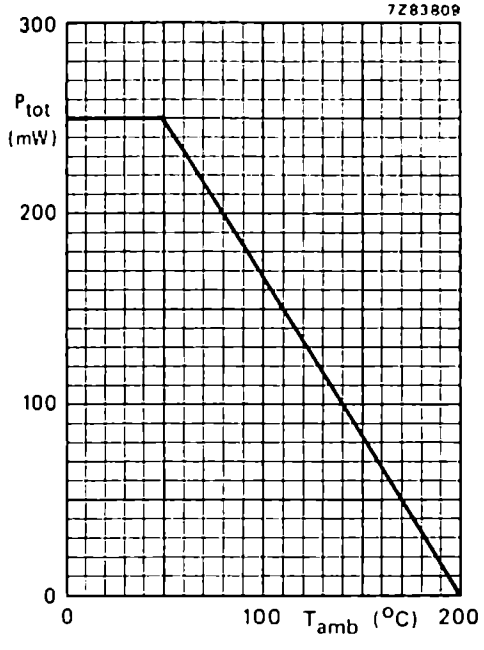


Fig. 2 Maximum permissible power dissipation in free air as a function of ambient temperature.

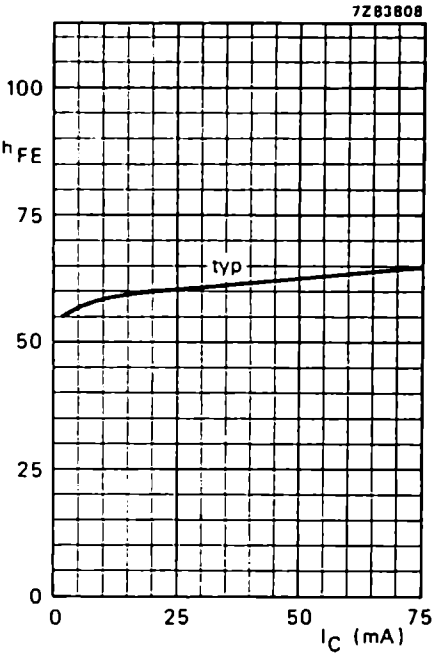


Fig. 3 V_{CE} = 5 V; T_j = 25 °C.

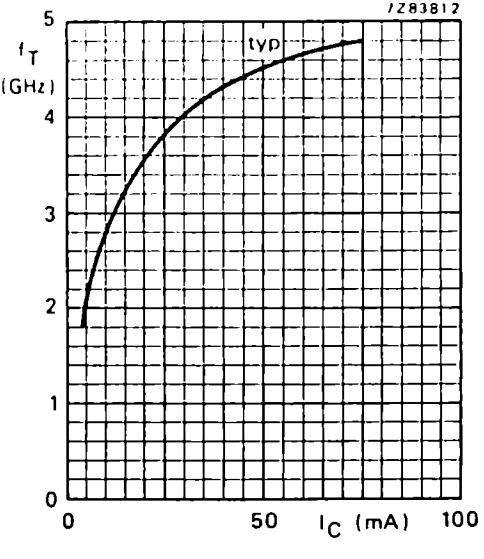


Fig. 4 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

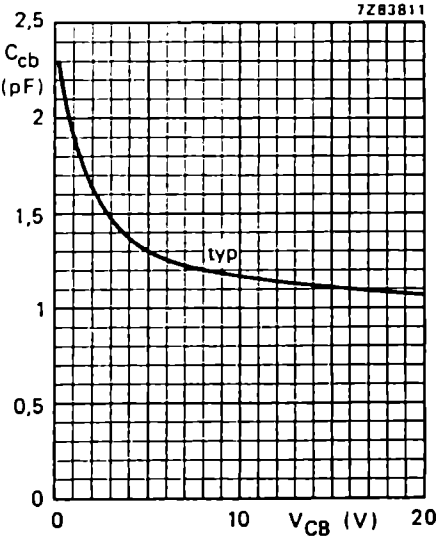


Fig. 5 I_C = 0; f = 1 MHz; T_j = 25 °C; shield lead and emitter lead connected to bridge earth.

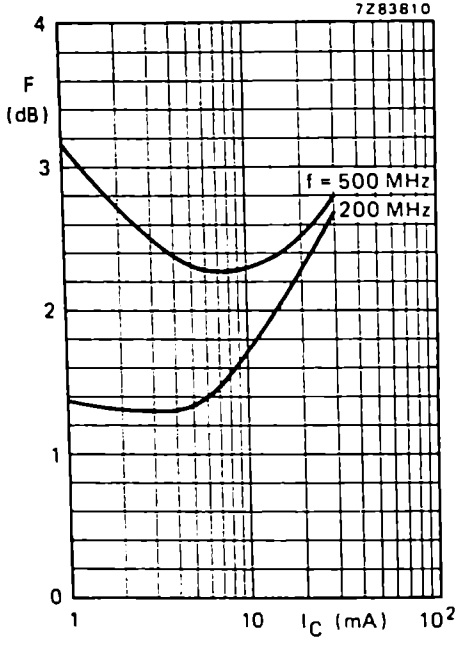


Fig. 6 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values.

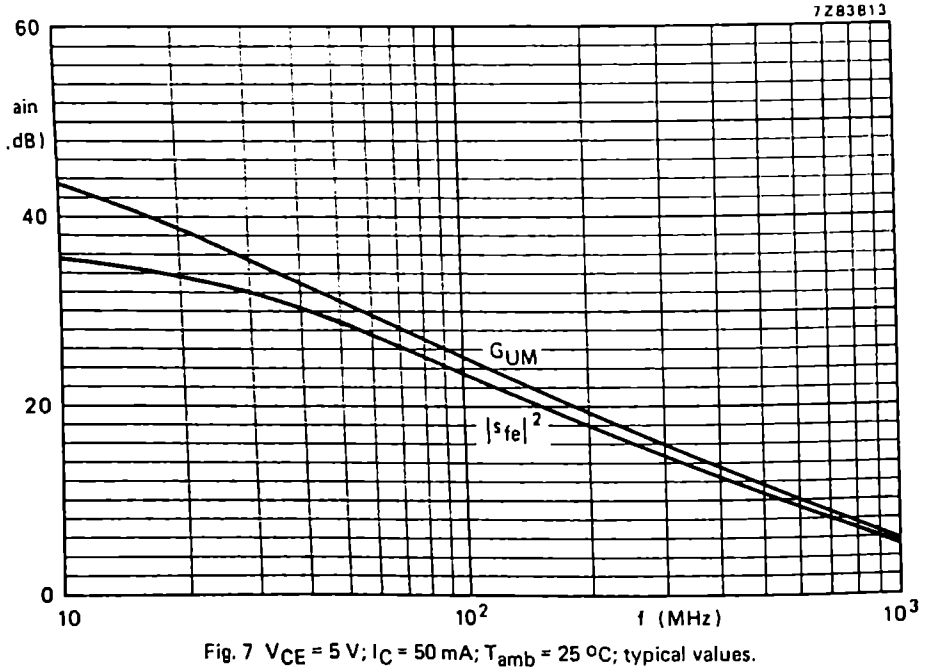


Fig. 7 V_{CE} = 5 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

N-P-N MICROWAVE TRANSISTOR

Small-signal planar epitaxial n-p-n transistor in plastic SOT-37 envelope and featuring a very high transition frequency and a very low noise figure up to high frequencies.

This device is designed for use in the GHz range.

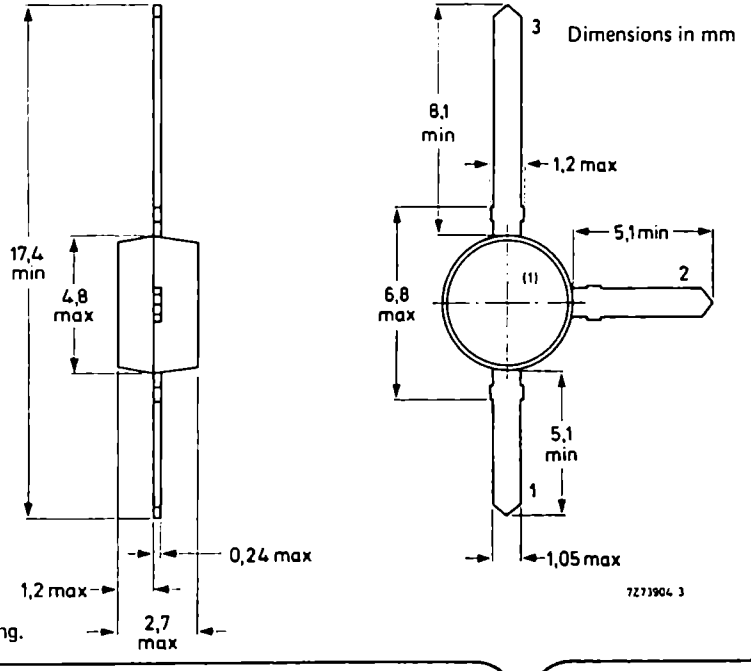
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20	V
Collector-emitter voltage	V_{CEO}	max.	10	V
Collector current (d.c.)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100	
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5	GHz
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C	G_{UM}	typ.	8,0	dB

MECHANICAL DATA

Fig. 1 SOT-37.

Dimensions in mm



Connections:

1. Base
2. Emitter
3. Collector

(1) Type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		−65 to + 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$		300 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 8 V	C_c	typ.	0,8 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,3 pF
Feedback capacitance I_C = 0; V_{CE} = 8 V	C_{re}	typ.	0,5 pF
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = 10 log $\frac{\lvert s_{fe} \rvert^2}{[1-\lvert s_{ie} \rvert^2][1-\lvert s_{oe} \rvert^2]}$ I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	8,0 dB
Noise figure at f = 2 GHz; R_S = 60 Ω; T_{amb} = 25 °C I_C = 5 mA; V_{CE} = 8 V I_C = 15 mA; V_{CE} = 8 V	F F	typ. typ.	2,5 dB 3,0 dB

N-P-N MICROWAVE TRANSISTOR

Small-signal planar epitaxial n-p-n transistor in HERMETICALLY SEALED microstripline envelope and designed for application in the GHz range.

Features:

- hermetically sealed envelope
- gold-metallized
- very high transition frequency and very low noise in the high frequency range

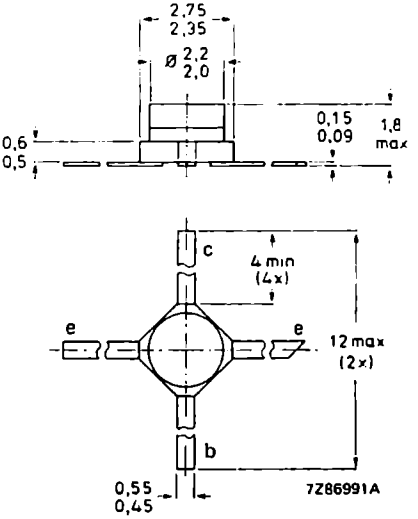
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	10 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C	P_{tot}	max.	350 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5 GHz
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C	G_{UM}	typ.	12,5 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 NO-243.



Marking code: Q6

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	350 mW
Storage temperature	T_{stg}		−65 to + 150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$		200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 8 V	C_c	typ.	0,7 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,3 pF
Feedback capacitance I_C = 0; V_{CE} = 8 V	C_{re}	typ.	0,45 pF
Maximum unilateral power gain (s_{re} assumed to be ZERO) G_{UM} (in dB) = 10 log $\frac{\lvert s_{fe} \rvert^2}{[1-\lvert s_{ie} \rvert^2][1-\lvert s_{oe} \rvert^2]}$ I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	12,5 dB
Noise figure at f = 2 GHz; R_S = 60 Ω; T_{amb} = 25 °C I_C = 5 mA; V_{CE} = 8 V I_C = 15 mA; V_{CE} = 8 V	F F	typ. typ.	2,5 dB 3,0 dB

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor primarily intended for final stages in MATV system amplifiers. This device is also suitable for use in low power band IV and V equipment. Diffused emitter ballasting resistors and the application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Collector current (d.c.)	I_C	max.	300 mA
Total power dissipation up to T_{mb} = 110 °C	P_{tot}	max.	4,5 W
Operating junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 240 mA; V_{CE} = 15 V	f_T	typ.	4 GHz
Output voltage at d_{im} = −60 dB (see Figs 2 and 12) I_C = 240 mA; V_{CE} = 15 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	1,6 V

MECHANICAL DATA

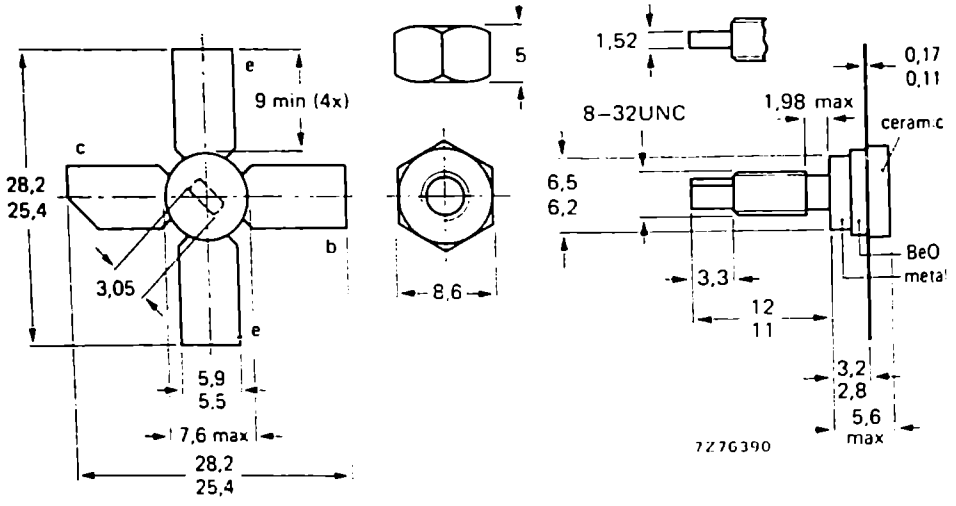
SOT 122 (see Fig. 1).

CAUTION This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	300 mA
Total power dissipation up to T_{mb} = 110 °C (see Fig. 7)	P_{tot}	max.	4,5 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	20,0 K/W*
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W*

* K/W is SI unit for °C/W.

CHARACTERISTICS

T_{amb} = 25 °C

Collector cut-off current I_E = 0; V_{CB} = 15 V	I_{CBO}	<	50 μA
D.C. current gain* I_C = 240 mA, V_{CE} = 15 V	h_{FE}	>	25
Transition frequency at f = 500 MHz* I_C = 240 mA; V_{CE} = 15 V	f_T	typ.	4 GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 15 V	C_c	typ.	3,8 pF
Emitter capacitance at f = 1 MHz $I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	20 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 15 V	C_{re}	typ.	2,2 pF
Collector-stud capacitance**	C_{cs}	typ.	0,8 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{(1-|s_{ie}|^2)(1-|s_{oe}|^2)}$$

I_C = 240 mA; V_{CE} = 15 V; f = 800 MHz	G_{UM}	typ.	13 dB

Output voltage at d_{im} = −60 dB (see Figs 2 and 12)
(DIN 45004B, par. 6.3: 3-tone)
I_C = 240 mA; V_{CE} = 15 V; R_L = 75 Ω

$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz
$V_q = V_o$ −6 dB ; f_q = 803,25 MHz
$V_r = V_o$ −6 dB ; f_r = 805,25 MHz
measured at $f_{(p+q-r)}$ = 793,25 MHz

	V_o	typ.	1,6 V

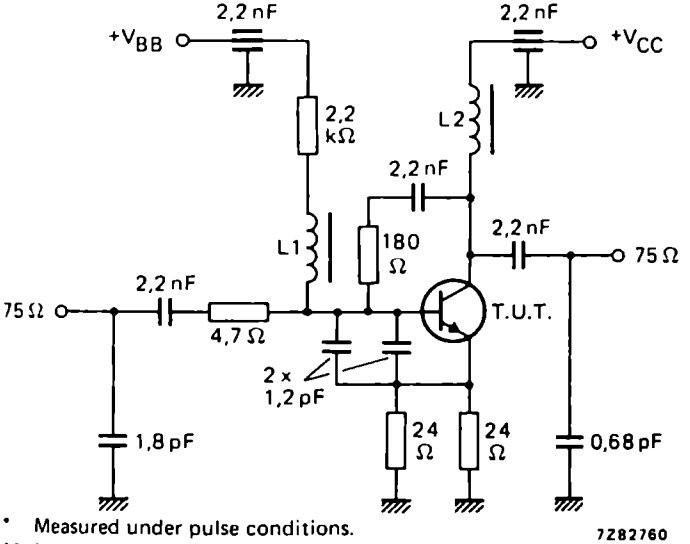


Fig. 2 Intermodulation distortion MATV test circuit. Power gain at f = 40 MHz to 860 MHz is typical 7 dB.

L1 = L2 = 5 μH micro choke.

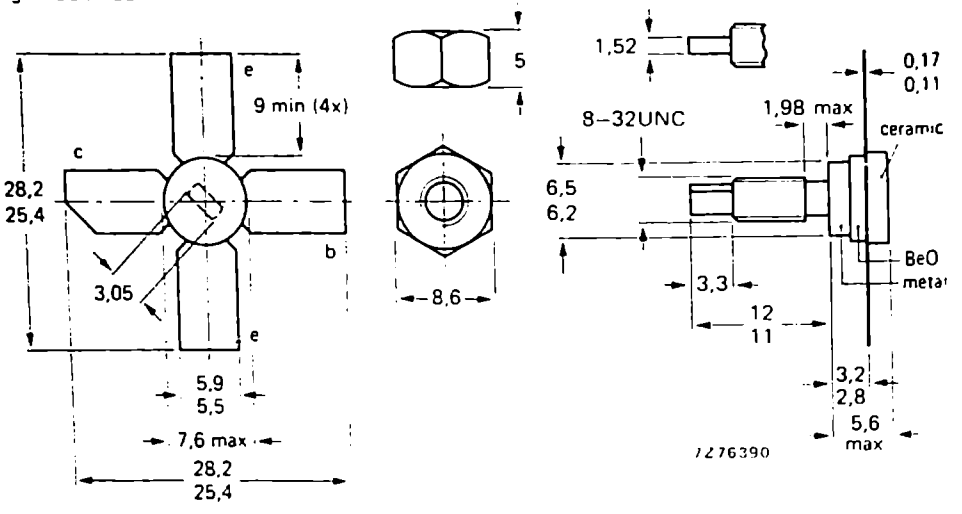
* Measured under pulse conditions.

** Measured with emitter and base grounded.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	300 mA
Total power dissipation up to T_{mb} = 110 °C (see Fig. 7)	P_{tot}	max.	4,5 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	20,0 K/W*
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W*

* K/W is SI unit for °C/W.

CHARACTERISTICS

T_{amb} = 25 °C

Collector cut-off current I_E = 0; V_{CB} = 15 V	I_{CBO}	<	50 μA
D.C. current gain* I_C = 240 mA; V_{CE} = 15 V	h_{FE}	>	25
Transition frequency at f = 500 MHz* I_C = 240 mA; V_{CE} = 15 V	f_T	typ.	4 GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 15 V	C_c	typ.	3,8 pF
Emitter capacitance at f = 1 MHz $I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	20 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 15 V	C_{re}	typ.	2,3 pF
Collector-stud capacitance**	C_{cs}	typ.	0,8 pF

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{(1-|s_{ie}|^2)(1-|s_{oe}|^2)}$$

I_C = 240 mA; V_{CE} = 15 V; f = 800 MHz	G_{UM}	typ.	13 dB

Output voltage at d_{im} = −60 dB (see Figs 2 and 12)
(DIN 45004B, par. 6.3: 3-tone)
I_C = 240 mA; V_{CE} = 15 V; R_L = 75 Ω

$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz
$V_q = V_o$ −6 dB ; f_q = 803,25 MHz
$V_r = V_o$ −6 dB ; f_r = 805,25 MHz
measured at $f_{(p+q-r)}$ = 793,25 MHz

	V_o	typ.	1,6 V

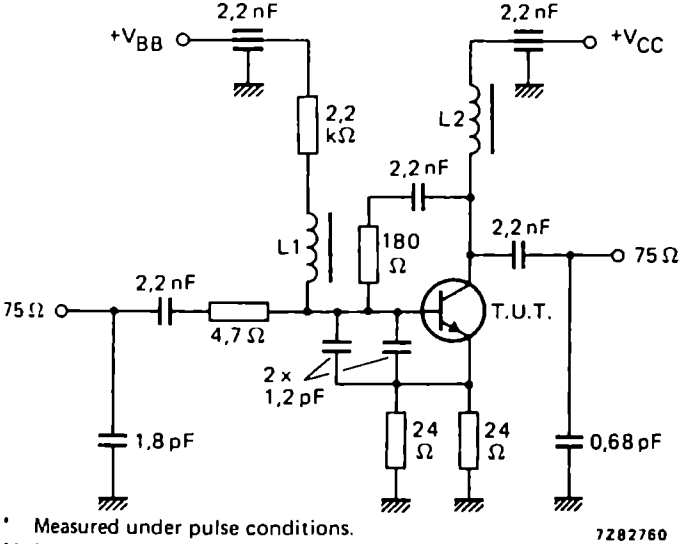


Fig. 2 Intermodulation distortion MATV test circuit. Power gain at f = 40 MHz to 860 MHz is typical 7 dB.
L1 = L2 = 5 μH micro choke.

* Measured under pulse conditions.
** Measured with emitter and base grounded.

s-parameters (common emitter) at V_{CE} = 7,5 V.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
	40	0,66/–135,7°	0,02/41,1°	30,4/124,0°	0,64/ –79,0°
	100	0,77/–164,0°	0,03/33,6°	14,8/101,2°	0,45/–125,3°
	200	0,80/–176,3°	0,03/44,1°	7,7/ 89,1°	0,39/–147,9°
50	500	0,80/ 170,2°	0,06/55,3°	3,1/ 70,3°	0,38/–159,5°
	800	0,78/ 157,0°	0,09/60,5°	2,0/ 57,2°	0,42/–165,6°
	1000	0,78/ 152,4°	0,11/61,8°	1,6/ 48,1°	0,43/–167,6°
	1200	0,75/ 142,7°	0,13/59,9°	1,4/ 41,1°	0,46/–171,2°
	40	0,67/–146,1°	0,02/40,9°	33,5/121,5°	0,64/ –90,4°
	100	0,78/–167,5°	0,02/37,2°	15,6/100,4°	0,49/–134,4°
	200	0,80/–178,3°	0,03/47,0°	8,1/ 89,2°	0,45/–155,5°
100	500	0,79/ 168,9°	0,06/60,4°	3,4/ 72,0°	0,43/–170,5°
	800	0,77/ 156,1°	0,09/62,0°	2,2/ 59,5°	0,44/–174,5°
	1000	0,77/ 151,5°	0,11/61,9°	1,8/ 51,5°	0,44/–178,5°
	1200	0,74/ 141,8°	0,14/59,4°	1,5/ 44,0°	0,46/–178,5°
	40	0,68/–149,0°	0,02/40,8°	34,3/120,6°	0,64/ –94,6°
	100	0,78/–168,8°	0,02/38,8°	15,9/100,0°	0,50/–138,0°
	200	0,80/–179,0°	0,03/49,0°	8,2/ 89,2°	0,47/–158,2°
150	500	0,79/ 168,5°	0,06/61,6°	3,4/ 72,5°	0,45/–173,2°
	800	0,77/ 155,8°	0,09/62,5°	2,2/ 60,3°	0,46/–177,1°
	1000	0,76/ 151,2°	0,12/62,1°	1,8/ 52,5°	0,46/ 177,1°
	1200	0,73/ 141,6°	0,14/59,1°	1,5/ 45,1°	0,47/ 177,1°
	40	0,68/–150,7°	0,02/40,5°	34,7/120,0°	0,64/ –97,3°
	100	0,78/–169,7°	0,02/39,6°	15,9/ 99,7°	0,51/–140,4°
	200	0,80/–179,8°	0,03/50,1°	8,2/ 89,0°	0,49/–159,8°
200	500	0,79/ 168,2°	0,06/62,1°	3,4/ 72,6°	0,47/–174,8°
	800	0,77/ 155,6°	0,09/62,6°	2,2/ 60,5°	0,47/–178,6°
	1000	0,76/ 150,9°	0,12/62,1°	1,8/ 52,9°	0,46/ 175,5°
	1200	0,73/ 141,4°	0,14/59,0°	1,5/ 45,3°	0,47/ 174,6°
	40	0,69/–151,9°	0,02/40,1°	34,6/119,4°	0,63/ –99,4°
	100	0,79/–170,3°	0,02/39,9°	15,8/ 99,5°	0,52/–141,8°
	200	0,80/ 180,0°	0,03/51,0°	8,1/ 88,9°	0,49/–160,9°
250	500	0,80/ 168,0°	0,06/62,5°	3,4/ 72,6°	0,47/–175,6°
	800	0,78/ 155,4°	0,09/62,8°	2,2/ 60,6°	0,48/–179,5°
	1000	0,77/ 150,8°	0,12/62,1°	1,8/ 53,0°	0,47/ 174,5°
	1200	0,73/ 141,3°	0,14/58,9°	1,5/ 45,6°	0,47/ 173,9°
	40	0,69/–152,9°	0,02/39,7°	34,4/118,9°	0,62/–101,2°
	100	0,79/–170,8°	0,02/40,1°	15,5/ 99,2°	0,52/–143,2°
	200	0,80/ 179,6°	0,03/51,5°	8,0/ 88,8°	0,50/–161,7°
300	500	0,80/ 167,9°	0,06/62,8°	3,4/ 72,5°	0,48/–176,2°
	800	0,78/ 155,3°	0,09/62,9°	2,2/ 60,5°	0,48/+ 179,8°
	1000	0,77/ 150,6°	0,12/62,1°	1,8/ 53,0°	0,47/ 173,9°
	1200	0,74/ 141,1°	0,14/59,1°	1,5/ 45,5°	0,48/ 173,4°

s-parameters (common emitter) at V_{CE} = 15 V.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
	40	0,63/−132,3°	0,02/41,8°	33,5/126,6°	0,62/ −72,9°
	100	0,75/−161,1°	0,02/34,0°	16,4/103,0°	0,41/−115,2°
	200	0,78/−174,8°	0,03/40,7°	8,6/ 90,1°	0,34/−139,4°
50	500	0,78/ 169,9°	0,06/56,8°	3,6/ 71,4°	0,34/−153,8°
	800	0,77/ 157,5°	0,08/60,9°	2,3/ 57,6°	0,37/−157,4°
	1000	0,74/ 150,3°	0,10/61,8°	1,9/ 48,8°	0,40/−160,3°
	1200	0,73/ 143,2°	0,12/61,0°	1,5/ 41,2°	0,42/−162,9°
	40	0,63/−140,5°	0,02/41,6°	36,4/125,0°	0,61/ −82,0°
	100	0,76/−164,8°	0,02/37,3°	17,5/102,3°	0,44/−126,8°
	200	0,78/−176,8°	0,03/46,7°	9,1/ 90,3°	0,39/−149,8°
100	500	0,77/ 168,8°	0,06/60,3°	3,8/ 72,6°	0,38/−164,2°
	800	0,76/ 156,7°	0,09/62,1°	2,4/ 60,0°	0,39/−168,6°
	1000	0,73/ 149,6°	0,11/61,7°	2,0/ 51,2°	0,40/−170,8°
	1200	0,72/ 142,6°	0,13/60,2°	1,7/ 44,6°	0,42/−172,6°
	40	0,64/−143,2°	0,02/41,1°	37,6/123,9°	0,60/ −86,5°
	100	0,76/−166,0°	0,02/38,3°	17,9/101,8°	0,45/−131,0°
	200	0,78/−177,5°	0,03/48,1°	9,3/ 90,2°	0,41/−153,1°
150	500	0,77/ 168,2°	0,06/61,2°	3,9/ 73,1°	0,40/−167,7°
	800	0,76/ 156,3°	0,09/62,2°	2,5/ 60,6°	0,40/−172,0°
	1000	0,72/ 149,2°	0,11/61,5°	2,0/ 52,2°	0,41/−174,6°
	1200	0,72/ 142,2°	0,13/59,5°	1,7/ 45,3°	0,42/−176,1°
	40	0,65/−144,0°	0,02/40,6°	38,5/122,8°	0,60/ −90,2°
	100	0,76/−166,7°	0,02/39,0°	18,0/101,2°	0,46/−133,7°
	200	0,78/−177,9°	0,03/49,1°	9,3/ 89,9°	0,42/−155,2°
200	500	0,77/ 168,0°	0,06/61,6°	3,9/ 73,3°	0,41/−169,7°
	800	0,76/ 156,1°	0,09/62,3°	2,5/ 60,9°	0,41/−174,0°
	1000	0,72/ 149,1°	0,11/61,5°	2,1/ 52,8°	0,42/−175,7°
	1200	0,71/ 142,1°	0,13/59,2°	1,7/ 45,8°	0,42/−177,3°
	40	0,66/−144,9°	0,02/40,7°	38,6/122,1°	0,60/ −91,6°
	100	0,76/−167,0°	0,02/39,2°	18,0/100,8°	0,46/−135,4°
	200	0,78/−178,1°	0,03/49,5°	9,3/ 89,7°	0,43/−156,2°
250	500	0,77/ 167,8°	0,06/62,0°	3,9/ 73,2°	0,42/−170,3°
	800	0,76/ 156,1°	0,09/62,4°	2,5/ 61,0°	0,41/−174,8°
	1000	0,72/ 148,9°	0,11/61,5°	2,0/ 52,6°	0,41/−177,2°
	1200	0,72/ 141,8°	0,14/58,8°	1,7/ 45,7°	0,41/−178,3°
	40	0,67/−145,2°	0,02/40,1°	38,7/121,3°	0,59/ −93,3°
	100	0,77/−167,3°	0,02/39,0°	17,9/100,3°	0,46/−136,5°
	200	0,79/−178,2°	0,03/49,6°	9,2/ 89,4°	0,43/−156,8°
300	500	0,78/ 167,7°	0,06/62,0°	3,9/ 72,9°	0,42/−170,6°
	800	0,76/ 156,1°	0,09/62,4°	2,5/ 60,8°	0,41/−174,7°
	1000	0,73/ 148,8°	0,11/61,4°	2,0/ 52,5°	0,41/−177,4°
	1200	0,72/ 142,0°	0,14/59,2°	1,7/ 45,7°	0,42/+177,4°

Conditions for Figs 3 and 4:

V_{CE} = 15 V; I_C = 240 mA;
T_{amb} = 25 °C.

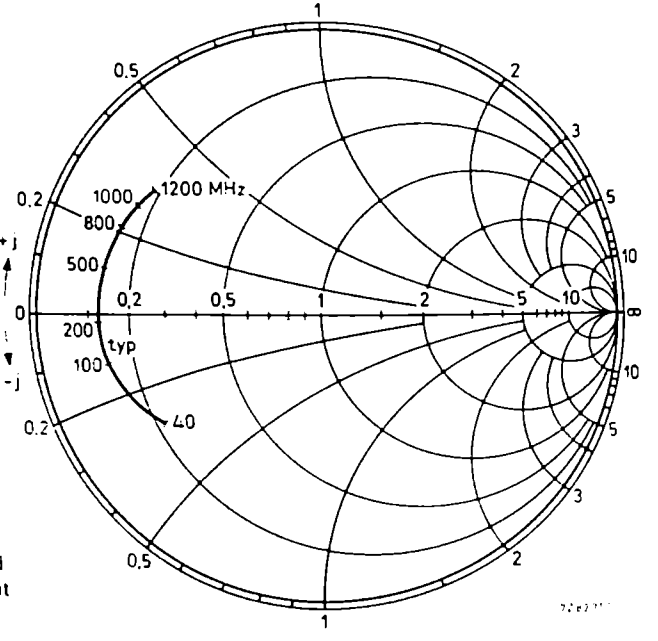


Fig. 3 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

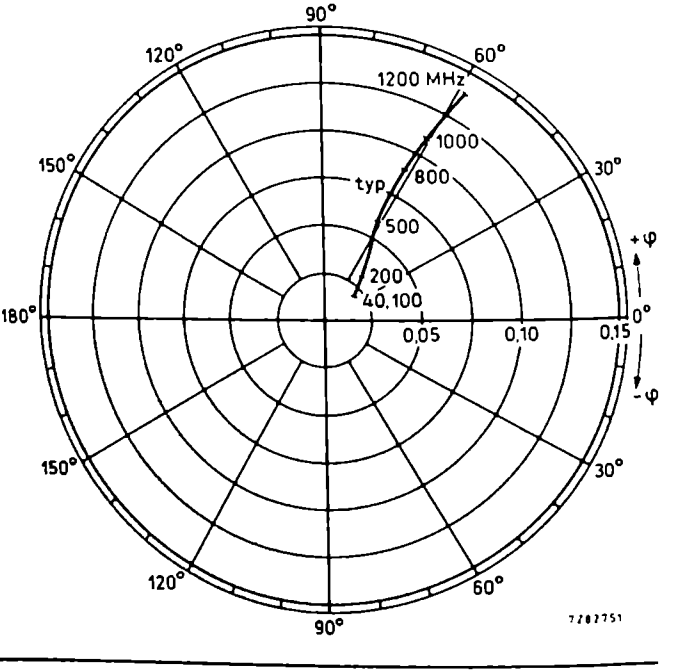


Fig. 4 Reverse transmission coefficient s_{re}.

Conditions for Figs 5 and 6:
V_{CE} = 15 V; I_C = 240 mA;
T_{amb} = 25 °C.

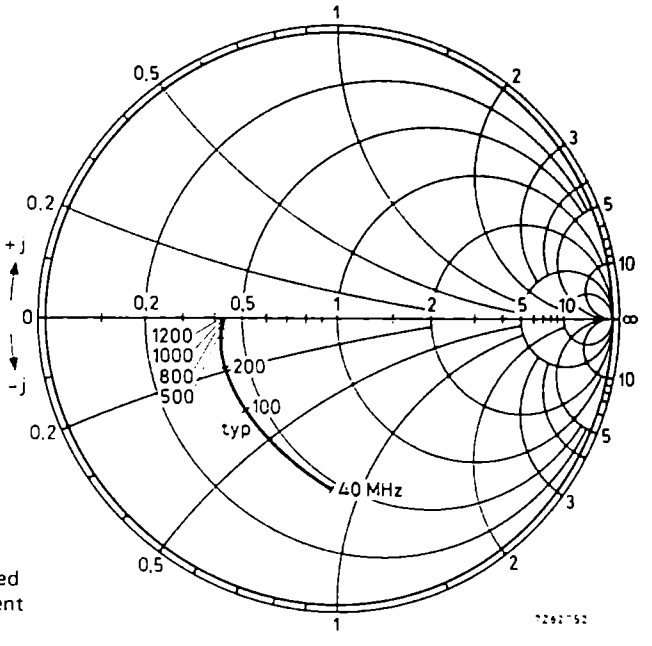


Fig. 5 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

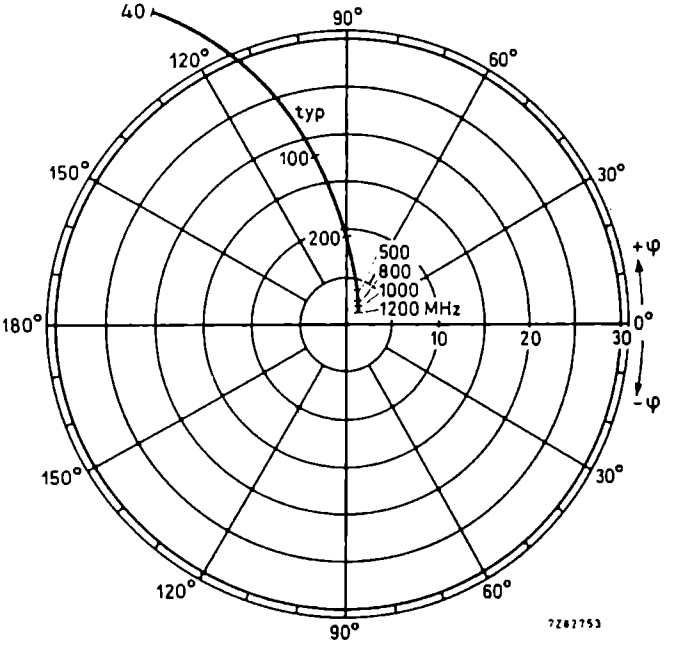


Fig. 6 Forward transmission coefficient s_{fe}.

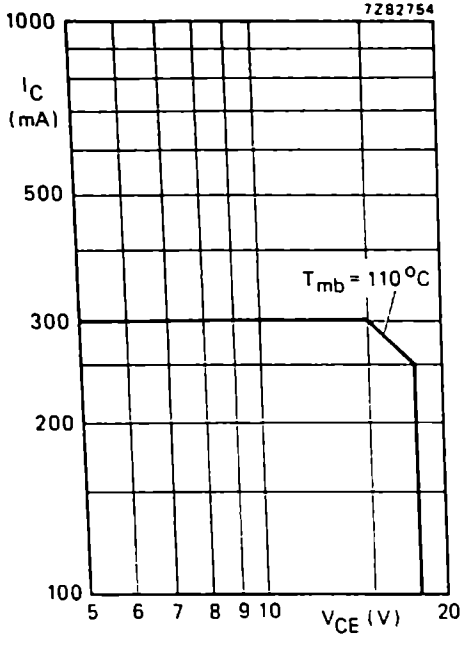


Fig. 7 D.C. SOAR.

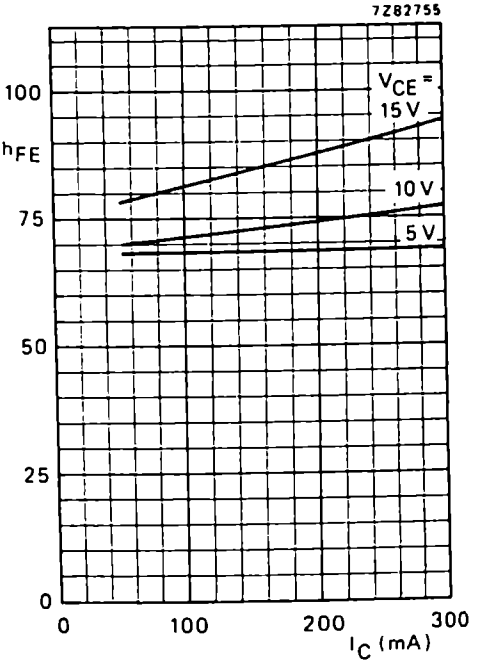


Fig. 8 T_j = 25 °C; typical values.

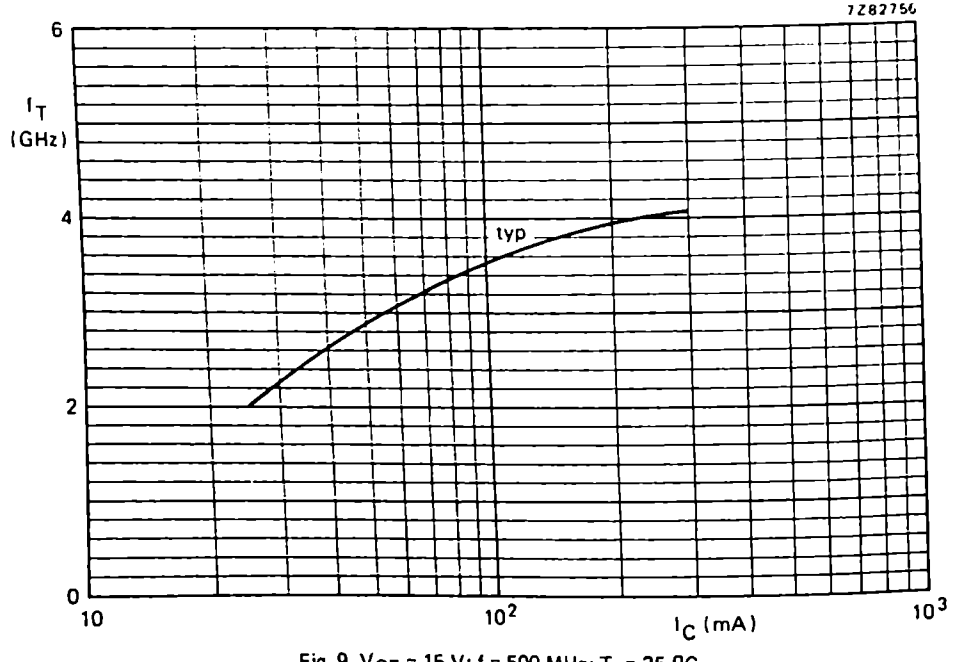


Fig. 9 V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C.

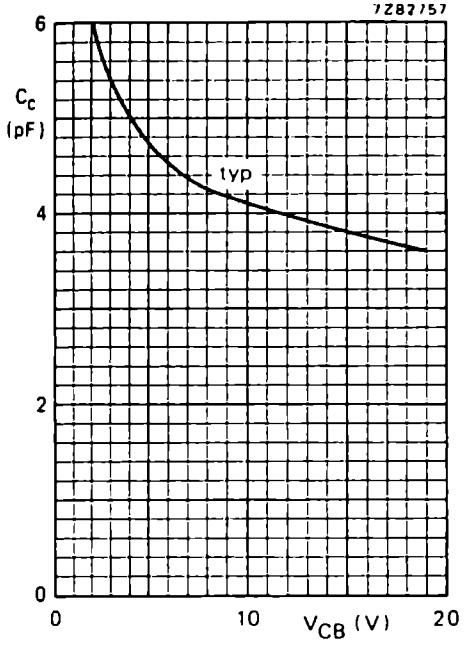


Fig. 10.

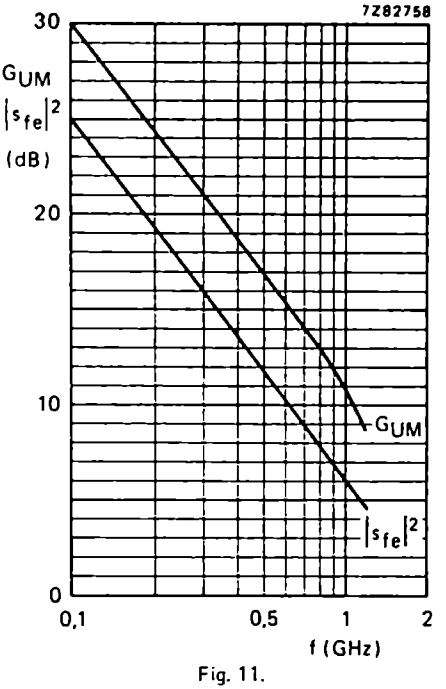


Fig. 11.

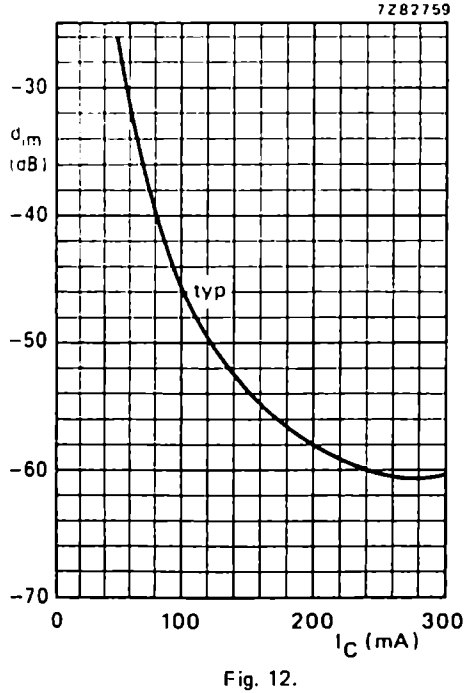


Fig. 12.

Conditions for Figs 10, 11 and 12:

Fig. 10 $I_E = I_e = 0$; $T_{amb} = 25\ ^oC$.

Fig. 11 $V_{CE} = 15$ V; $I_C = 240$ mA; $T_{amb} = 25\ ^oC$; typical values.

Fig. 12 $V_{CE} = 15$ V; $V_o = 1{,}6$ V; $f_{(p+q-r)} = 793{,}25$ MHz; $T_{amb} = 25\ ^oC$; measured in MATV test circuit (see Fig. 2).

N-P-N SILICON MICROWAVE TRANSISTOR

The BFR49 is a microwave transistor featuring a high transition frequency and low noise. A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits. It is suitable for amplifiers up to S-band frequencies in instrumentation and microwave systems.

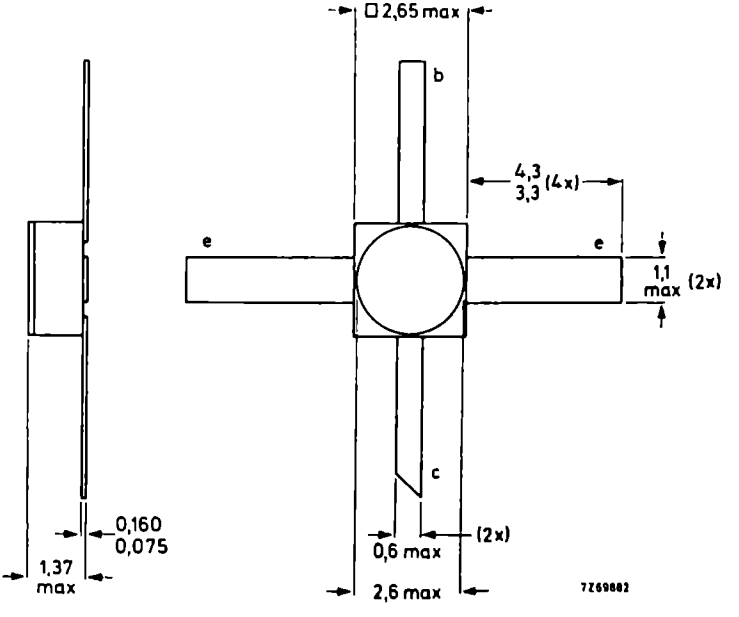
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max	20	V
Collector-emitter voltage (open base)	V_{CEO}	max	15	V
Collector current (d.c.)	I_C	max	25	mA
Total power dissipation up to T_{amb} = 110 °C	P_{tot}	max	180	mW
Transition frequency I_C = 14 mA; V_{CE} = 10 V	f_T	typ	5	GHz
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 1 GHz	F	typ	2,5	dB
Transducer power gain I_C = 14 mA; V_{CE} = 10 V; f = 1 GHz	$\lvert s_{fe} \rvert^2$	typ	15,5	dB

MECHANICAL DATA

Dimensions in mm

SOT-100



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; I_C = 10 μA)	V_{CBO}	max	20 V
Collector-emitter voltage (open base; I_C = 10 mA)	V_{CEO}	max	15 V
Emitter-base voltage (open collector; I_E = 10 μA)	V_{EBO}	max	2 V
Collector current (d.c.)	I_C	max	25 mA
Total power dissipation up to T_{amb} = 110 °C	P_{tot}	max	180 mW
Storage temperature	T_{stg}	−65 to +	200 °C
Junction temperature	T_j	max	200 °C

THERMAL RESISTANCE

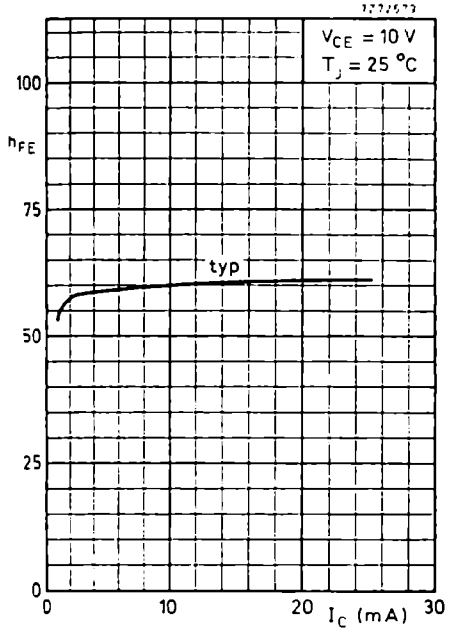
From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0,5 °C/mW

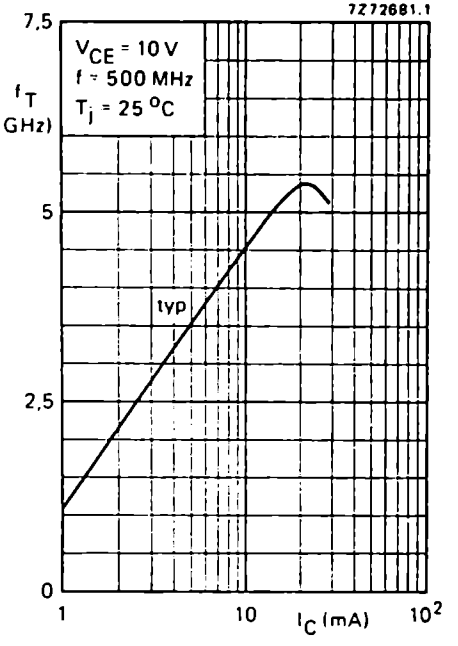
CHARACTERISTICS

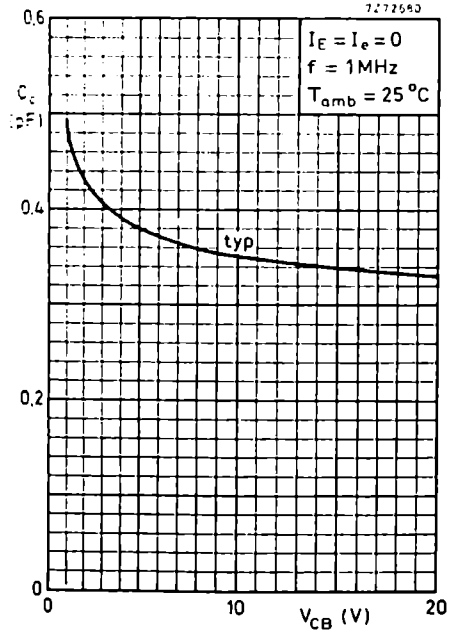
T_{amb} = 25 °C unless otherwise specified

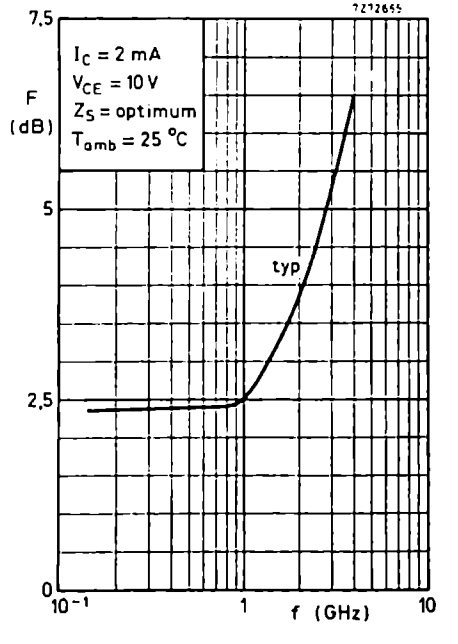
Collector cut-off current			
I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50 nA
D.C. current gain *			
I_C = 14 mA; V_{CE} = 10 V	h_{FE}	>	25
Transition frequency *			
I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz	f_T	typ	5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ	0,35 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ	1,1 pF
Feedback capacitance at f = 1 MHz			
I_C = 2 mA; V_{CE} = 10 V	C_{re}	typ	0,3 pF
Noise figure at optimum source impedance			
I_C = 2 mA; V_{CE} = 10 V; f = 1 GHz	F	typ	2,5 dB
I_C = 2 mA; V_{CE} = 10 V; f = 4 GHz	F	typ	6,5 dB
Maximum unilateral power gain (s_{re} assumed to be zero)			
$G_{UM}\ (\text{in dB}) = 10 \log \dfrac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$			
I_C = 14 mA; V_{CE} = 10 V; f = 1 GHz	G_{UM}	typ	17,0 dB
I_C = 14 mA; V_{CE} = 10 V; f = 4 GHz	G_{UM}	typ	6,5 dB
Transducer power gain			
I_C = 14 mA; V_{CE} = 10 V; f = 1 GHz	$\lvert s_{fe} \rvert^2$	typ	15,5 dB
I_C = 14 mA; V_{CE} = 10 V; f = 4 GHz	$\lvert s_{fe} \rvert^2$	typ	3,5 dB

* Measured under pulse conditions.

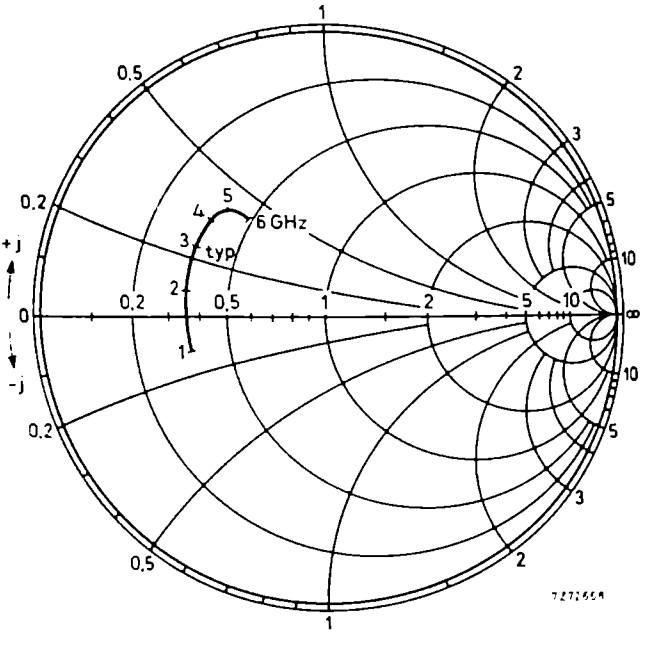

7272679
V_{CE} = 10 V
T_j = 25 °C
h_{FE}
100
75
50
25
0
typ
0
10
20
30
I_C (mA)


7Z72681.1
V_{CE} = 10 V
f = 500 MHz
T_j = 25 °C
f_T (GHz)
7,5
5
2,5
0
typ
1
10
10^2
I_C (mA)


7272680
$I_E = I_e = 0$
f = 1 MHz
T_{amb} = 25 °C
C_c (pF)
0,6
0,4
0,2
0
typ
0
10
20
V_{CB} (V)

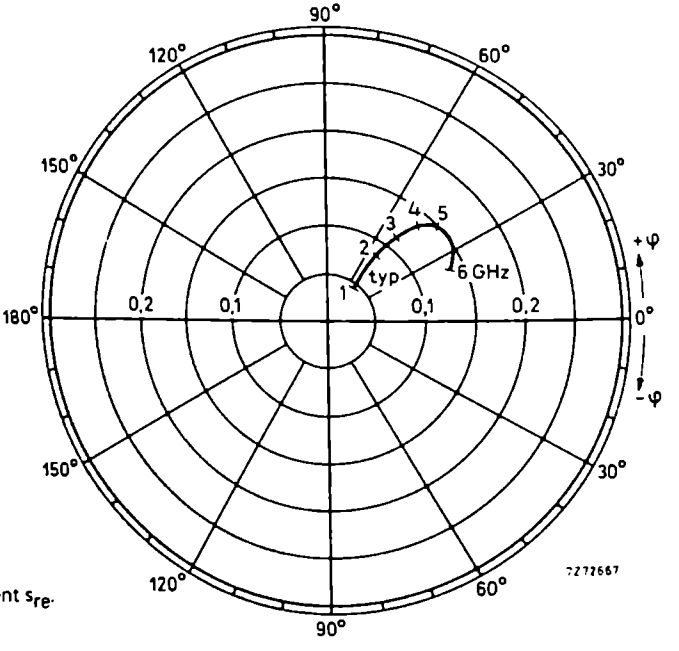

7272655
I_C = 2 mA
V_{CE} = 10 V
Z_S = optimum
T_{amb} = 25 °C
F (dB)
7,5
5
2,5
0
typ
10^{-1}
1
10
f (GHz)

V_{CE} = 10 V
I_C = 14 mA
T_{amb} = 25 °C



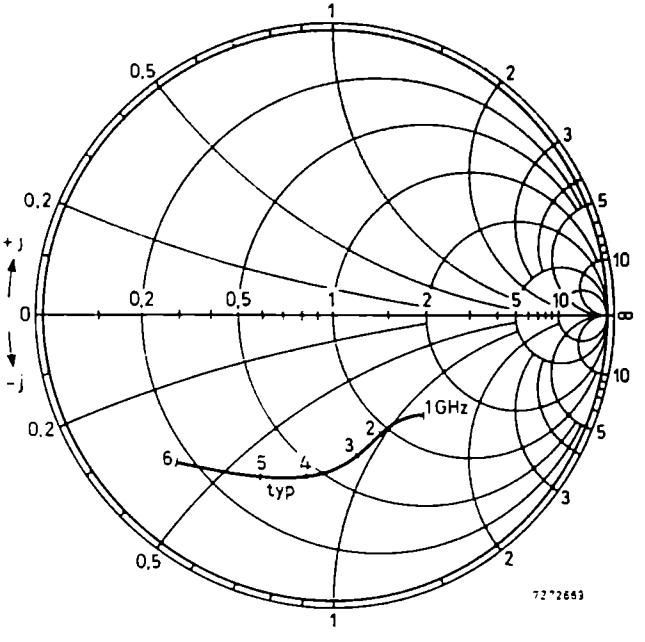
Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

V_{CE} = 10 V
I_C = 14 mA
T_{amb} = 25 °C



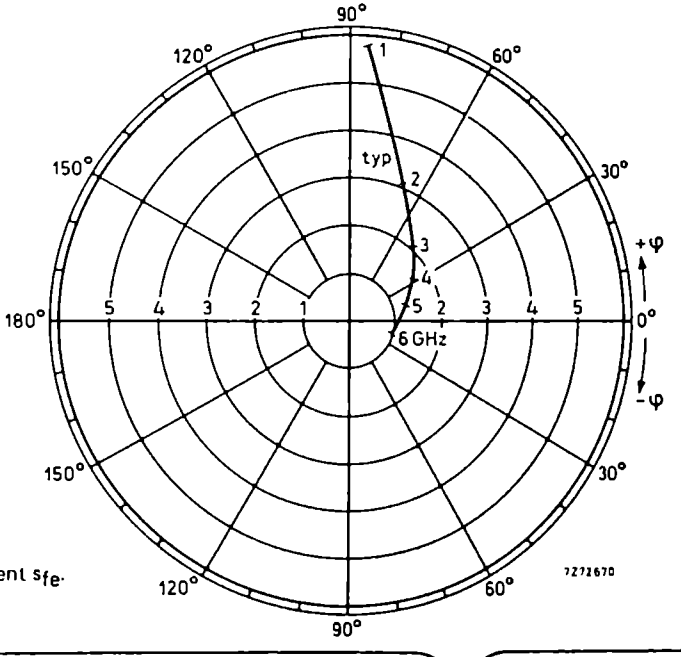
Reverse transmission coefficient s_{re}.

V_{CE} = 10 V
I_C = 14 mA
T_{amb} = 25 °C

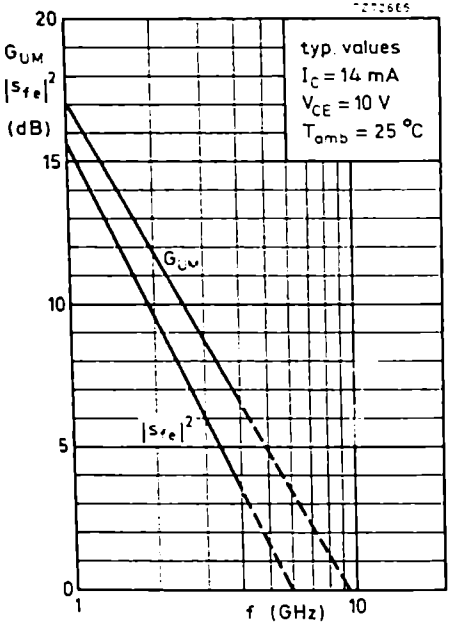


Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

V_{CE} 10 V
I_C 14 mA
T_{amb} = 25 °C



Forward transmission coefficient s_{fe}.


20
G_{UM}
$|s_{fe}|^2$
(dB)
15
10
5
0
1
10
f (GHz)
typ. values
$I_C = 14$ mA
$V_{CE} = 10$ V
$T_{amb} = 25$ °C
G_{UM}
$|s_{fe}|^2$

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter transistor in a capstan envelope. The transistor has extremely good intermodulation properties and high power gain.

The device is primarily intended for:

a Final and driver stages of channel and band aerial amplifiers with high output power for band I, II, III and IV/V (40-860 MHz).
b Final and driver stages of wideband amplifiers (40-230 MHz).
c Final stages of the wideband vertical amplifier in high-speed oscilloscopes.
c Frequency multiplier and oscillator circuits.

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value)	I_{CM}	max.	500 mA
Total power dissipation up to T_{mb} = 60 °C; f ⩾ 1 MHz	P_{tot}	max.	3,5 W
Junction temperature	T_j	max.	150 °C
Transition frequency at f = 500 MHz I_C = 75 mA; V_{CE} = 20 V	f_T	>	1200 MHz
Output power at f = 200 MHz I_C = 70 mA; V_{CE} = 20 V; d_{im} = −30 dB	P_o	typ.	150 mW
Power gain at f = 200 MHz I_C = 70 mA; V_{CE} = 20 V	G_p	typ.	16 dB

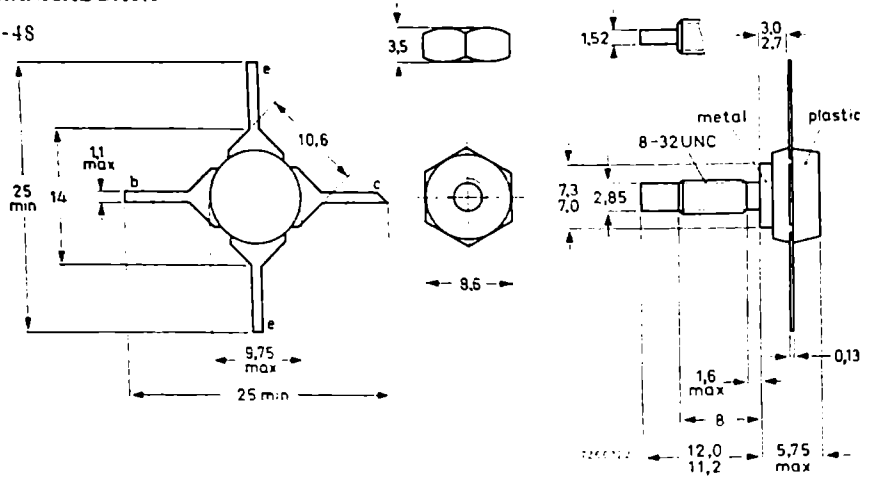
MECHANICAL DATA (see page 2)

CAUTION. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V 1)
Collector-emitter voltage (R_{BE} = 10 Ω; peak value)	V_{CERM}	max.	40	V 2)
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V 2)
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V 3)
Currents				
Collector current (d.c.)	I_C	max.	200	mA
Collector current (peak value) f > 1 MHz	I_{CM}	max.	500	mA
Power dissipation (f > 1 MHz; see SOAR)				
Total power dissipation up to T_{mb} = 60 °C	P_{tot}	max.	3,5	W
Temperatures				
Storage temperature	T_{stg}	−40 to +150		°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	25 °C/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,5 °C/W

1) at I_C = 100 μA. 2) at I_C = 10 mA. 3) at I_E = 100 μA.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 20 V	I_{CBO}	<	10	μA
Saturation voltage				
I_C = 100 mA; I_B = 10 mA	V_{CEsat}	<	0,75	V
D.C. current gain				
I_C = 50 mA; V_{CE} = 5 V	h_{FE}	>	25	
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	>	25	
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 20 V	C_c	<	4,5	pF
Feedback capacitance at f = 1 MHz				
I_C = 10 mA; V_{CE} = 20 V; T_{mb} = 25 °C	C_{re}	typ.	1,7	pF
Noise figure at f = 200 MHz				
I_C = 40 mA; V_{CE} = 20 V; R_S = 75 Ω; T_{mb} = 25 °C	F	typ.	6	dB
Transition frequency at f = 500 MHz				
I_C = 15 mA; V_{CE} = 20 V	f_T	typ.	1000	MHz
I_C = 75 mA; V_{CE} = 20 V	f_T	>	1200	MHz
I_C = 150 mA; V_{CE} = 20 V	f_T	typ.	1200	MHz
Output power at f = 200 MHz; T_{mb} = 25 °C				
I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2 f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB measured at $f_{(2q-p)}$ = 208 MHz (channel 9)	P_o	> typ.	130 150	mW mW
Output power at f = 800 MHz; T_{mb} = 25 °C				
I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2 f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB measured at $f_{(2q-p)}$ = 806 MHz (channel 62)	P_o	 typ.	70 90	mW mW
Power gain (not neutralized) T_{mb} = 25 °C				
I_C = 70 mA; V_{CE} = 20 V; f = 200 MHz	G_p	> typ.	15 16	dB dB
I_C = 70 mA; V_{CE} = 20 V; f = 800 MHz	G_p	typ.	6,5	dB

/

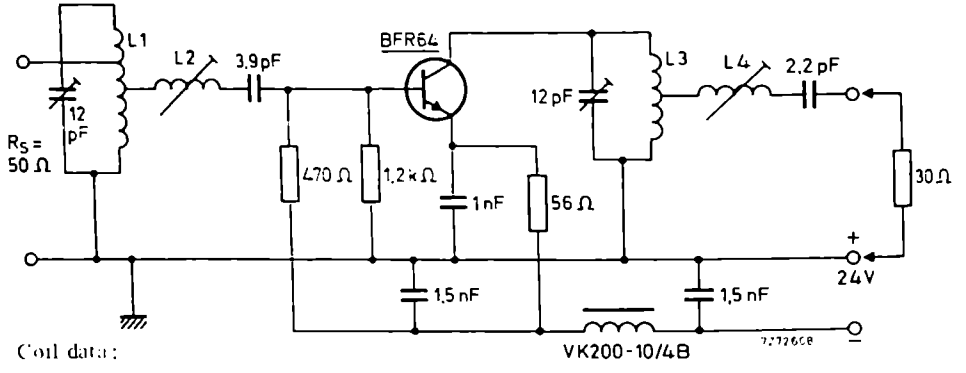
CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at f = 200 MHz; T_{mb} = 25 °C

I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (channel 9)

Test circuit:



Coil data:

L1 = 3 turns silver-plated Cu wire (1,4 mm); winding pitch 2,7 mm; int. dia. 8 mm; taps at 0,5 turn and 1,5 turns from earth.
L2 = 5,5 turns silver-plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. dia. 8 mm
L3 = 3 turns silver-plated Cu wire (1,4 mm); winding pitch 3,3 mm; int. dia. 8 mm
L4 = 5,5 turns silver-plated Cu wire (1,4 mm); winding pitch 2,2 mm; int. dia. 11 mm

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dß is caused by h.f. output current-voltage clipping.
The maximum undistorted output power is realized, if

a. Current and voltage clipping take place concurrently.
   This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

   in which V_{CEK} is the high-frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short-circuited input.

For maximum output power at an intermodulation distortion of −30 dß, the (experimentally found) values of R_L and C_L are:
$R_L = 220\ \Omega$; $C_L = -4$ pF.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 220 Ω resistor in parallel with a 4 pF capacitor between the collector and emitter connections of the output circuit.

2. Tune and match the output circuit for zero reflection at 205 MHz (VSWR = 1).
   After this adjustment, no further change may be made in the output circuit.

3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band-pass curve.
   The VSWR of the output will then, in most cases, be ≤ 2 over the whole channel.
   Corrections can be made by tuning L2; this will not disturb the band-pass curve.

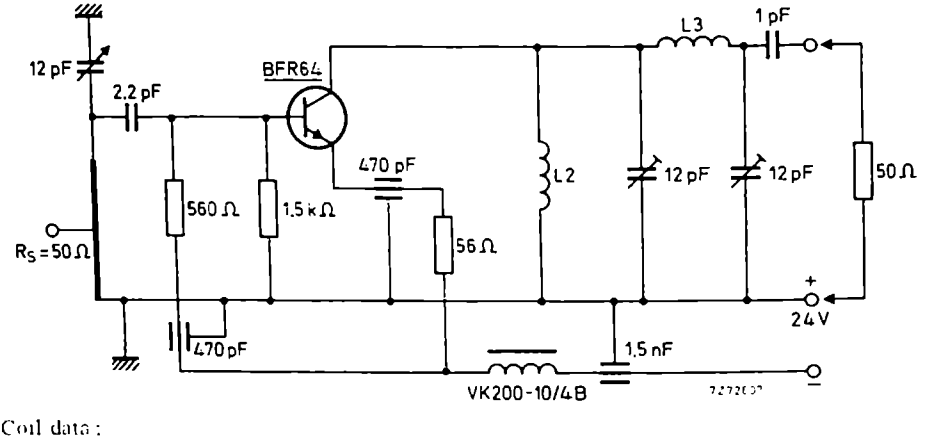
CHARACTERISTICS (continued)

Intermodulation characteristics

2. Output power at f = 800 MHz; T_{mb} = 25 °C

I_C = 70 mA; V_{CE} = 20 V; VSWR at output = 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = − 30 dB
measured at $f_{(2q-p)}$ = 806 MHz (channel 62)

Test circuit:



Coil data:

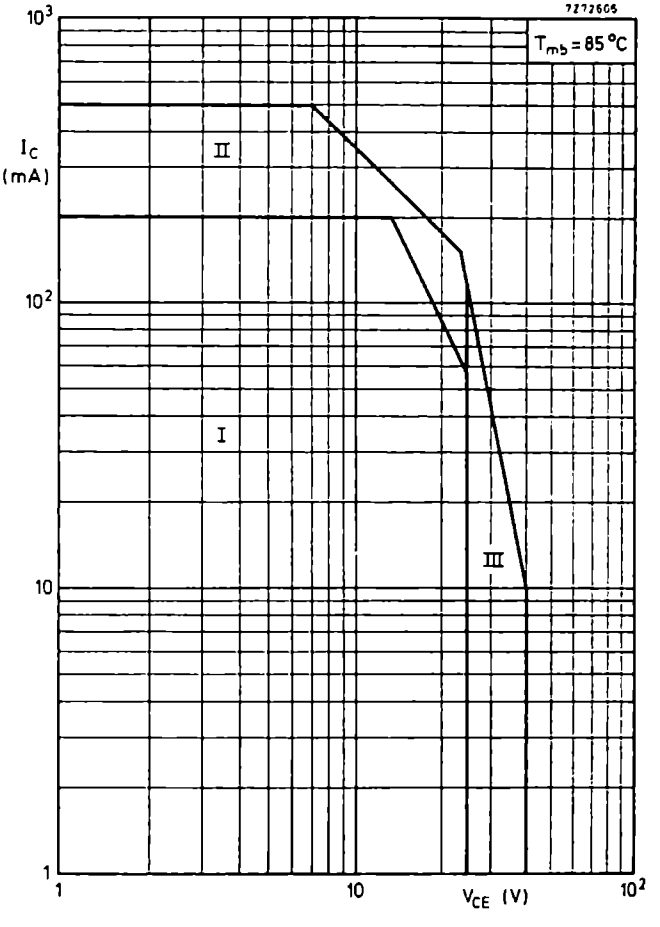
L1 = 25 mm x 7 mm x 0,85 mm silver-plated Cu strip
Tap of the input at 5 mm from earth.
L2 = 13 turns enamelled Cu wire (0,6 mm); int. dia. 8 mm
L3 = 1,5 turns Cu wire (1,3 mm); int. dia. 8 mm

Basis of adjustment

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearily with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

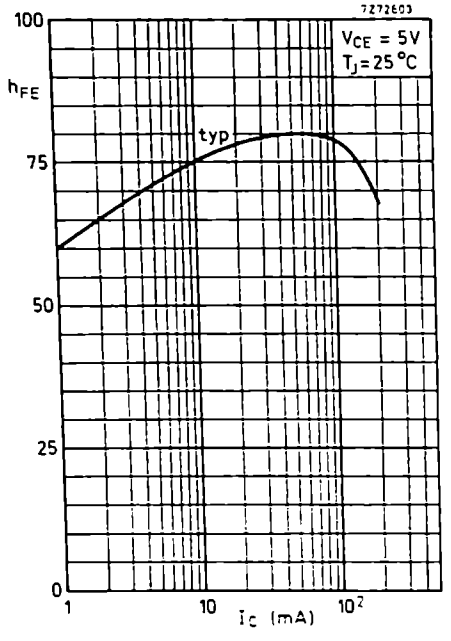
$$P_o = \frac{I_C(V_{CE} - V_{CEK})}{2} = 480 \text{ mW}.$$

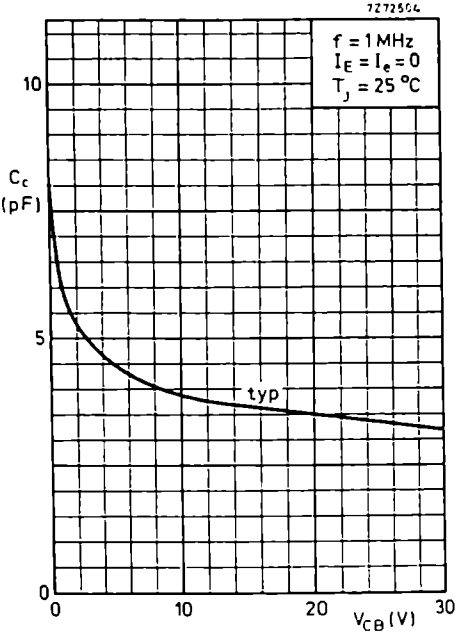
The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 480 mW. With this adjusting method, care must be taken that the transistor is not damaged by second breakdown (the voltage swing may not exceed the rated V_{CER} value). Therefore as soon as clipping occurs, the increase of the input signal should be stopped until the clipping has been eliminated. After this adjustment has been made no further change may be made in the output circuit. Adjust the input circuit for maximum power gain and good band-pass curve. The VSWR of the output is then ≤ 2 over the whole channel.

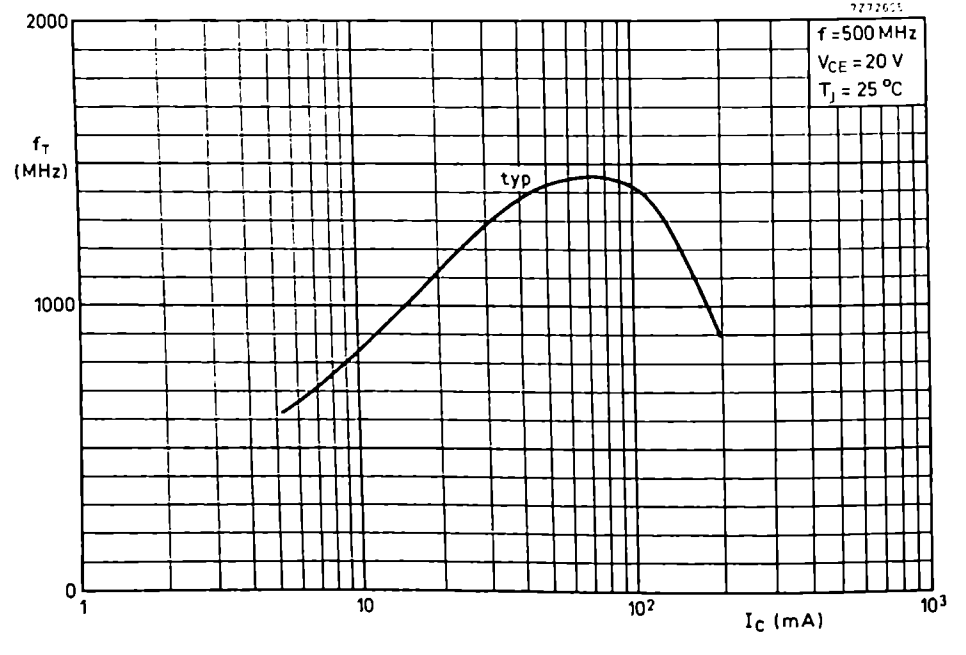


Safe Operating Area with the transistor forward biased

I Region of permissible d.c. operation
II Permissible extension for repetitive pulsed operation: f > 1 MHz
III Repetitive pulse operation in this region is allowable, provided R_{BE} < 10 Ω and f > 1 MHz


7Z72603
100
h_{FE}
75
50
25
0
1
10
10^2
I_C (mA)
V_{CE} = 5V
T_j = 25 °C
typ


7Z72604
10
C_c
(pF)
5
0
0
10
20
30
V_{CB} (V)
f = 1 MHz
$I_E = I_e = 0$
T_j = 25 °C
typ


7Z72605
2000
f_T
(MHz)
1000
0
1
10
10^2
10^3
I_C (mA)
f = 500 MHz
V_{CE} = 20 V
T_j = 25 °C
typ

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter silicon transistor in a capstan envelope. The transistor has extremely good inter-modulation properties and high power gain.

The device is primarily intended for channel amplifiers in aerial amplifier systems as well as other applications where an excellent f_T linearity and higher signal handling capabilities than available in existing devices are required.

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value)	I_{CM}	max.	1000 mA
Junction temperature	T_j	max.	200 °C
Thermal resistance from junction to mounting base	$R_{th\ j\text{-}mb}$	=	15 °C/W
Transition frequency at f = 500 MHz I_C = 200 mA; V_{CE} = 20 V	f_T	>	1200 MHz
Output power at f = 200 MHz I_C = 200 mA; V_{CE} = 20 V; d_{im} = −30 dB	P_o	typ.	450 mW
Power gain at f = 200 MHz I_C = 200 mA; V_{CE} = 20 V	G_p	typ.	19 dB

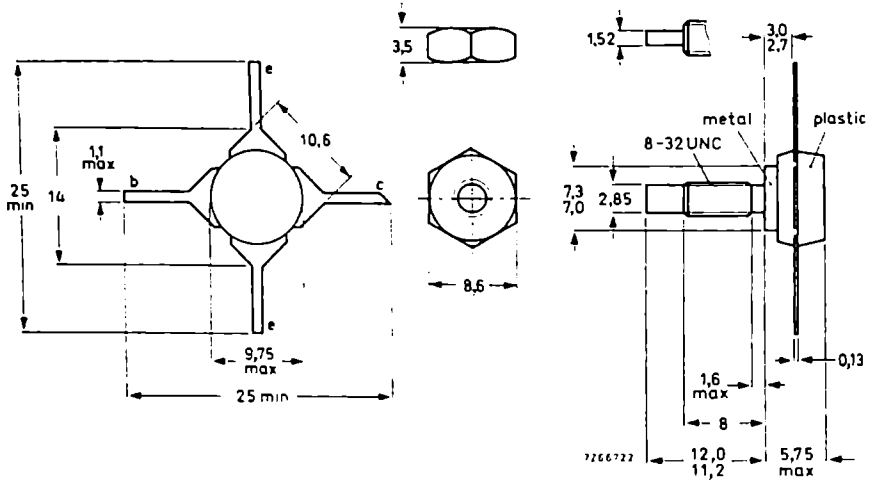
MECHANICAL DATA (see page 2)

CAUTION. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm (7,5 kg cm) 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm. Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (R_{BE} = 10 Ω; peak value)	V_{CERM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	400 mA
Collector current (peak value) f > 1 MHz	I_{CM}	max.	1000 mA
Total power dissipation up to T_{mb} = 125 °C see also page 6	P_{tot}	max.	5 W
Storage temperature	T_{stg}	−65 to	+200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	15 °C/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,5 °C/W

CHARACTERISTICS

$T_j = 25\,^{\circ}C$ unless otherwise specified

Breakdown voltages				
Collector-base voltage				
open emitter, $I_C = 1$ mA	$V_{(BR)CBO}$	>	40	V
Collector-emitter voltage				
$R_{BE} = 10\ \Omega$, $I_C = 5$ mA	$V_{(BR)CER}$	>	40	V
open base, $I_C = 5$ mA	$V_{(BR)CEO}$	>	25	V
Emitter-base voltage				
open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	3.5	V
Collector cut-off current				
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	100	μA
Saturation voltage				
$I_C = 200$ mA; $I_B = 20$ mA	V_{CEsat}	<	0.75	V
D.C. current gain				
$I_C = 200$ mA; $V_{CE} = 20$ V	h_{FE}	>	30	
$I_C = 400$ mA; $V_{CE} = 20$ V	h_{FE}	>	20	
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 20$ V	C_c	<	10	pF
Feedback capacitance at f = 1 MHz				
$I_C = 10$ mA; $V_{CE} = 20$ V; $T_{mb} = 25\,^{\circ}C$	C_{re}	typ.	3.5	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF
Transition frequency at f = 500 MHz				
$I_C = 200$ mA; $V_{CE} = 20$ V	f_T	>	1200	MHz
$I_C = 400$ mA; $V_{CE} = 20$ V	f_T	>	1000	MHz
Output power at f = 200 MHz; $T_{mb} = 25\,^{\circ}C$				
$I_C = 200$ mA; $V_{CE} = 20$ V; V.S.W.R. at output < 2 $f_p = 202$ MHz; $f_q = 205$ MHz; $d_{im} = -30$ dB measured at $f_{(2q-p)} = 208$ MHz (channel 9)	P_o	typ.	450	mW
Power gain (not neutralized) $T_{mb} = 25\,^{\circ}C$				
$I_C = 200$ mA; $V_{CE} = 20$ V; f = 200 MHz	G_p	>	15	dB
		typ.	19	dB
$I_C = 200$ mA; $V_{CE} = 20$ V; f = 800 MHz	G_p	typ.	4.5	dB

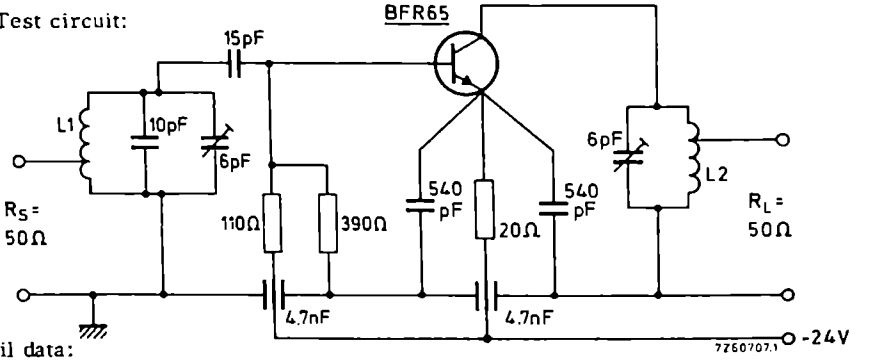
CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at f = 200 MHz; T_{mb} = 25 °C

I_C = 200 mA; V_{CE} = 20 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (channel 9)

Test circuit:



Coil data:

L1 = 1 turn silver plated Cu wire (1.4 mm); int. diam. 8 mm; tap at 0.75 turn from earth.

L2 = 3 turns silver plated Cu wire (1.4 mm); int. diam. 8 mm; winding pitch 2.7 mm; tap at 2.5 turns from earth.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current − voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

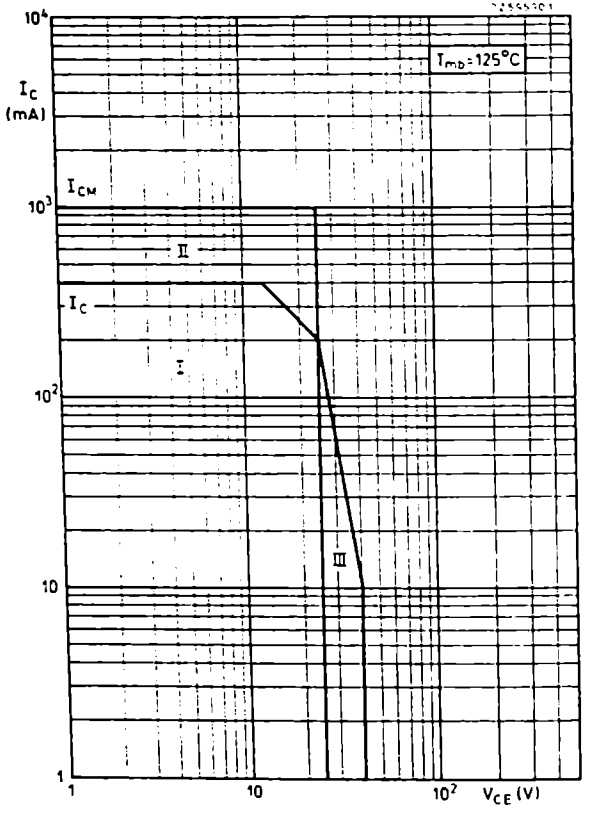
in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
This is so if $-C_L = +C_{oe}$.
in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 91\ \Omega$; $C_L = -6.8$ pF.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 91 Ω resistor in parallel with a 6.8 pF capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1)
After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.

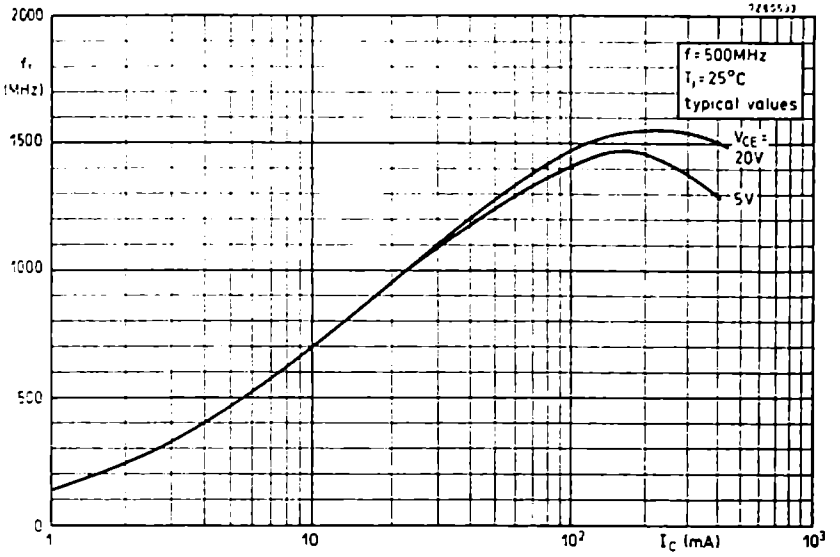


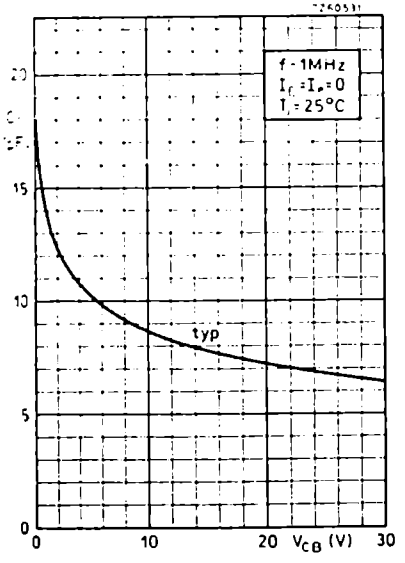
Safe Operating Area with the transistor forward biased

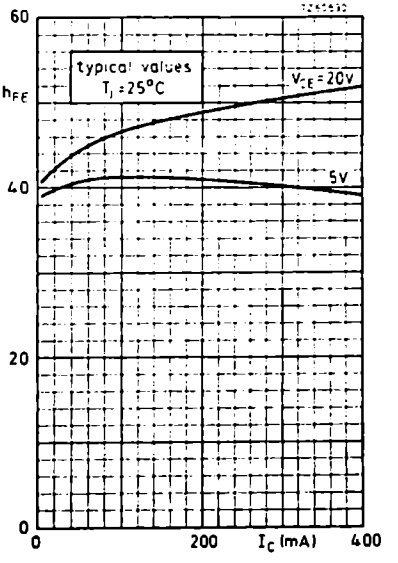
I Region of permissible d.c. operation

II Permissible extension for repetitive pulsed operation; f > 1 MHz

III Repetitive pulsed operation in this region is allowable, provided f > 1 MHz; R_{BE} < 10 Ω


2000
f_t
(MHz)
1500
1000
500
0
1
10
10^2
I_C (mA)
10^3
f = 500MHz
T_j = 25°C
typical values
V_{CE} = 20V
5V


20
15
10
5
0
0
10
20
V_{CB} (V)
30
f = 1MHz
$I_E = I_e = 0$
T_j = 25°C
typ


60
h_{FE}
40
20
0
0
200
I_C (mA)
400
typical values
T_j = 25°C
V_{CE} = 20V
5V

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.

It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz				
I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0.4	pF
Noise figure at optimum source impedance				
I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4	dB
Maximum unilateral power gain (see page 3)				
I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	19.5	dB
Intermodulation distortion at T_{amb} = 25 °C				
I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; V_o = 150 mV				
$d_{im} = d_{(p+q-r)}$ 493.25 MHz (see page 4)	d_{im}	typ.	−60	dB

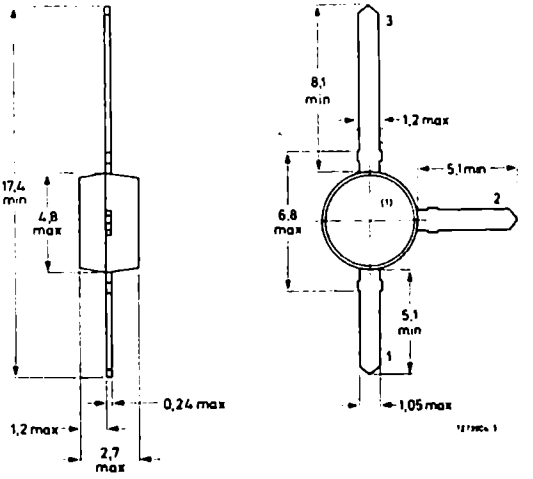
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

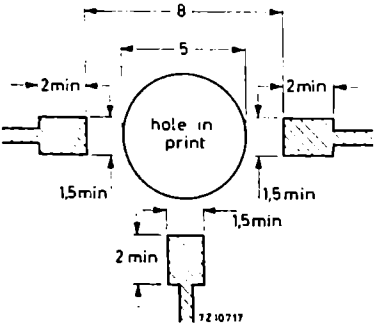
Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0	V
Current				
Collector current (d.c.)	I_C	max.	25	mA
Power dissipation				
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Temperatures				
Storage temperature	T_{stg}	−65 to	+150	°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air				
mounted on a glass-fibre print *) of 40 mm × 25 mm × 1 mm	$R_{th\,j\text{-}a}$	=	0,5	°C/mW

*) Requirements for glass-fibre print

(dimensions in mm)



CHARACTERISTICS T_j 25 °C unless otherwise specified

Collector cut-off current				
$I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	<	50	nA
D.C. current gain [1]				
$I_C = 14$ mA; $V_{CE} = 10$ V	h_{FE}	typ.	40 90	
Transition frequency at $f = 500$ MHz [1]				
$I_C = 14$ mA; $V_{CE} = 10$ V	f_T	typ.	5	GHz
Collector capacitance at $f = 1$ MHz				
$I_E = I_e = 0$; $V_{CB} = 10$ V	C_c	typ.	0.5	pF
Emitter capacitance at $f = 1$ MHz				
$I_C = I_c = 0$; $V_{EB} = 0.5$ V	C_e	typ.	1.2	pF
Feedback capacitance at $f = 1$ MHz				
$I_C = 0$; $V_{CE} = 10$ V; $T_{amb} = 25$ °C	C_{re}	typ.	0.4	pF
Noise figure at optimum source impedance				
$I_C = 2$ mA; $V_{CE} = 10$ V; $f = 500$ MHz; $T_{amb} = 25$ °C	F	typ.	2.4	dB
Maximum unilateral power gain (s_{re} assumed to be zero)				
G_{UM} (in dB) $= 10 \log \dfrac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$				
$I_C = 14$ mA; $V_{CE} = 10$ V; $f = 500$ MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	19.5	dB

[1] Measured under pulse conditions.

CHARACTERISTICS (continued)

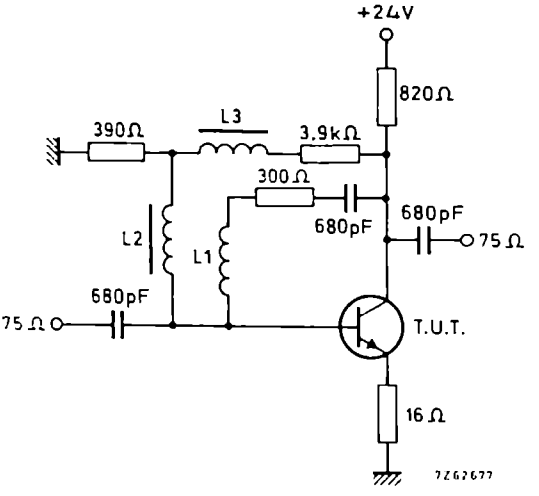
Intermodulation distortion at $T_{amb} = 25\,^{\circ}C$

$I_C = 14\,mA$; $V_{CE} = 10\,V$; $R_L = 75\,\Omega$; V.S.W.R. ≤ 2

$V_p = V_o = 150\,mV$ at $f_p = 495.25\,MHz$
$V_q = V_o - 6\,dB$ at $f_q = 503.25\,MHz$
$V_r = V_o - 6\,dB$ at $f_r = 505.25\,MHz$

Measured at $f_{(p+q-r)} = 493.25\,MHz$ d_{im} typ. -60 dB

Intermodulation test circuit:



L1 = 4 turns Cu wire (0.35 mm); winding pitch 1 mm; int. diam. 4 mm
L2 and L3 5 μH (code number: 3122 108 20150)

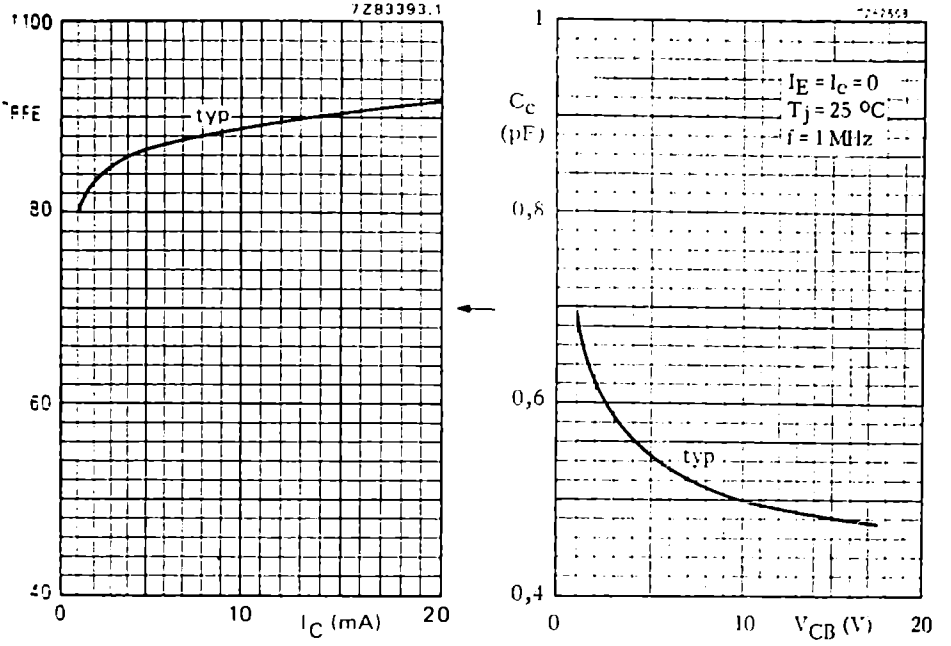
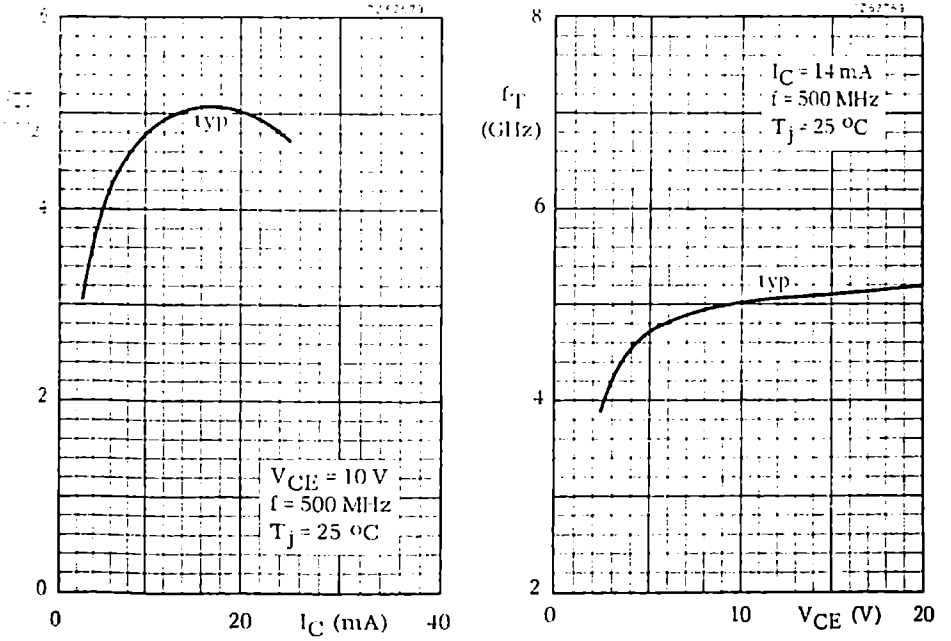
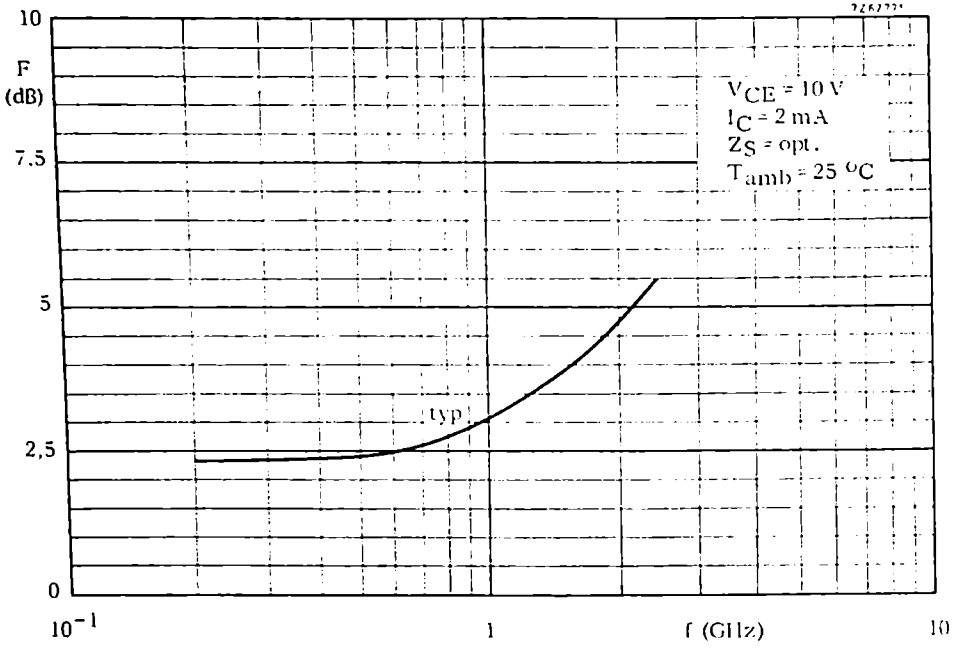
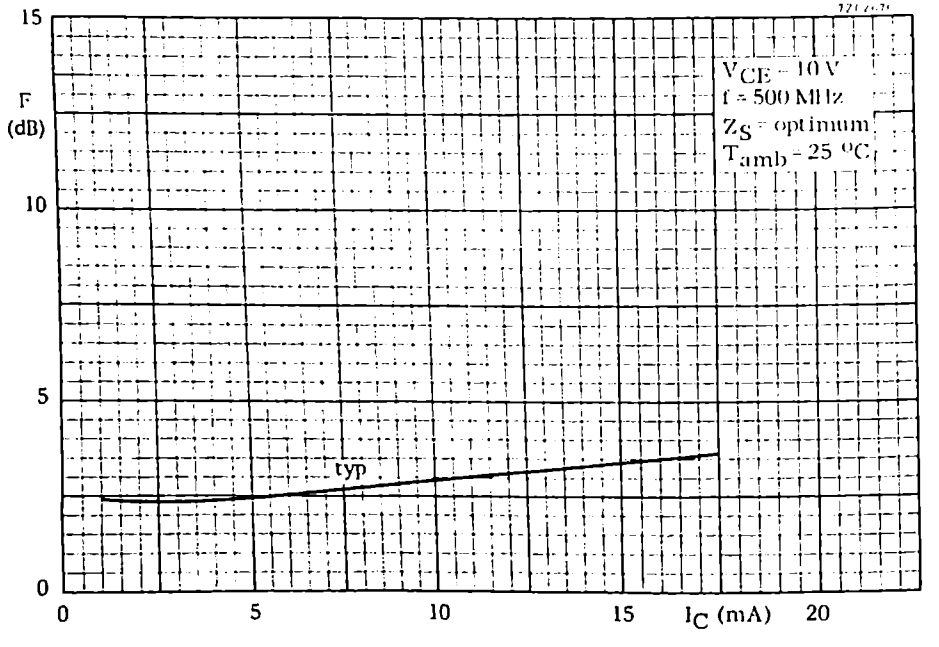


Fig. 4 $V_{CE} = 10$ V; $T_j = 25$ °C.




10
F
(dB)
7,5
5
2,5
0
10^{-1}
1
f (GHz)
10
V_{CE} = 10 V
I_C = 2 mA
Z_S = opt.
T_{amb} = 25 °C
typ.


15
F
(dB)
10
5
0
0
5
10
15
I_C (mA)
20
V_{CE} = 10 V
f = 500 MHz
Z_S = optimum
T_{amb} = 25 °C
typ.

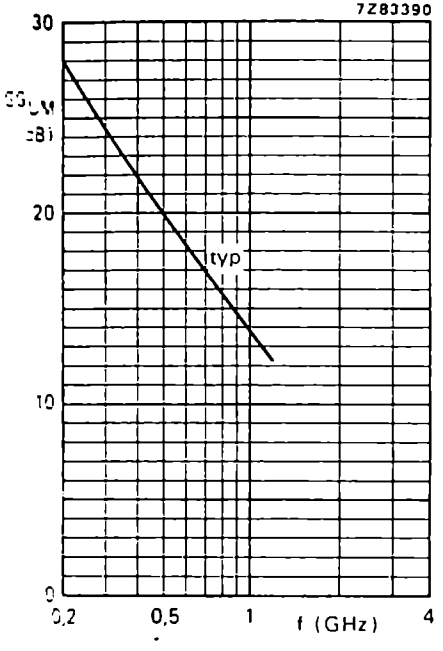
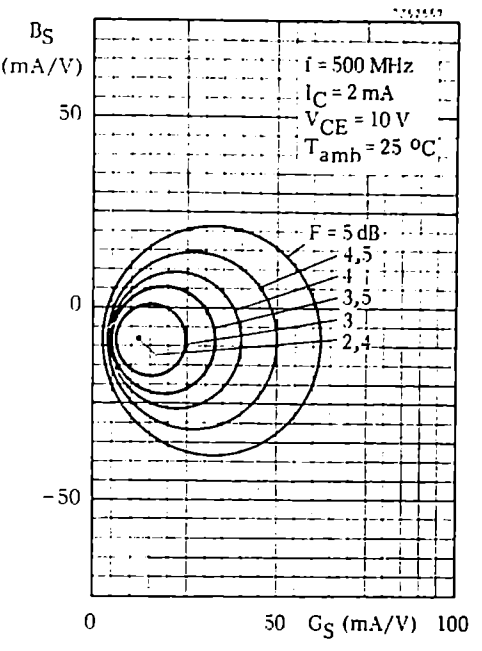


Fig. 10 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C.

circles of constant noise figure



SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package primarily intended for use in v.h.f. and u.h.f. wideband amplifiers.

Features of this product:

- low noise;
- low intermodulation distortion;
- high power gain;
- gold metallization.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open-base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 °C
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,35 pF
Noise figure at R_S = 60 Ω I_C = 4 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	1,8 dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	150 mV

MECHANICAL DATA

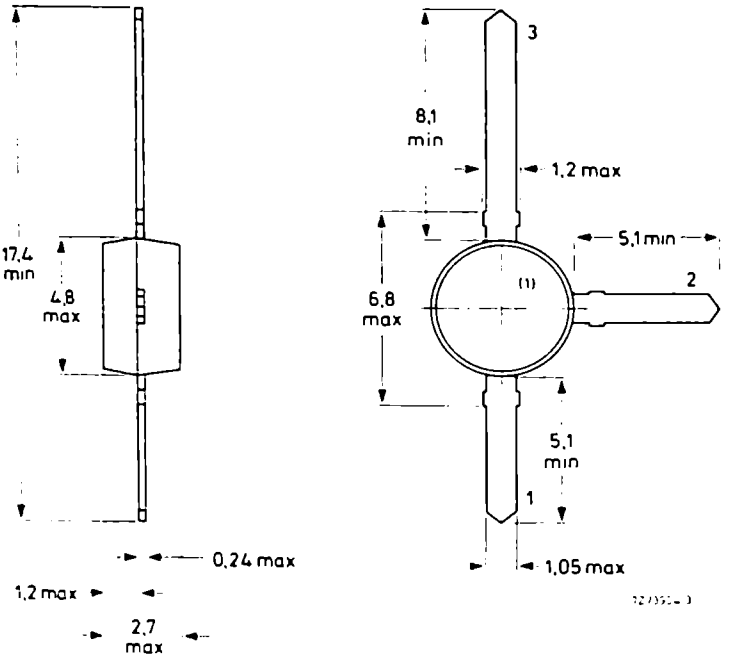
SOT-37 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections
1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2) of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	500 K/W*

* K/W is SI unit for °C/W.

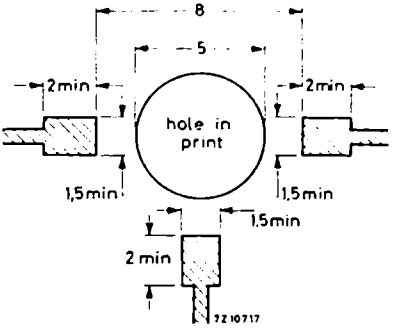


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50	nA
DC current gain *				
I_C = 14 mA; V_{CE} = 10 V	h_{FE}	>	40	
		typ.	90	
Transition frequency at f = 500 MHz *				
I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} 10 V	C_c	typ.	0,6	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c$ = 0; V_{EB} 0,5 V	C_e	typ.	1,2	pF
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,35	pF
Noise figure at T_{amb} = 25 °C				
I_C = 4 mA; V_{CE} = 10 V; R_S = 60 Ω; f = 800 MHz	F	typ.	1,8	dB
I_C = 4 mA; V_{CE} = 10 V; $Z_S = Z_{Sopt}$; f = 2 GHz	F	typ.	3,6	dB

* Measured under pulse conditions.

s-parameters (common emitter)

V_{CE} V	I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
5	2	40	0,91/ −7,7°	0,01/84°	6,8/173°	1,00/ −2,7°
		200	0,79/ −37,3°	0,03/71°	6,5/143°	0,93/−12,5°
		500	0,52/ −81,0°	0,06/59°	4,6/116°	0,80/−22,5°
		800	0,34/−114,5°	0,08/58°	3,3/ 97°	0,73/−27,0°
		1000	0,26/−137,6°	0,09/59°	2,8/ 87°	0,70/−30,0°
		1200	0,22/−165,0°	0,10/61°	2,4/ 79°	0,67/−33,0°
5	5	40	0,80/ −11,7°	0,01/81°	14,4/169°	0,99/ −4,5°
		200	0,59/ −51,0°	0,03/68°	11,2/134°	0,85/−17,0°
		500	0,29/ −95,0°	0,05/66°	6,3/103°	0,70/−22,0°
		800	0,16/−130,0°	0,07/69°	4,2/ 88°	0,64/−26,0°
		1000	0,12/−162,0°	0,09/70°	3,4/ 81°	0,63/−28,0°
		1200	0,12/+ 158,0°	0,10/71°	2,9/ 74°	0,61/−31,0°
5	10	40	0,67/ −16,7°	0,01/80°	23,3/164°	0,97/ −6,6°
		200	0,39/ −63,0°	0,02/70°	14,5/122°	0,76/−18,0°
		500	0,15/−109,0°	0,05/73°	7,0/ 96°	0,64/−20,0°
		800	0,09/−152,0°	0,07/75°	4,6/ 84°	0,60/−24,0°
		1000	0,07/+ 155,0°	0,09/75°	3,7/ 77°	0,59/−26,0°
		1200	0,10/+ 124,0°	0,11/74°	3,1/ 72°	0,58/−29,0°
5	14	40	0,58/ −20,0°	0,01/79°	28,3/160°	0,96/ −7,8°
		200	0,30/ −71,0°	0,02/72°	15,5/117°	0,72/−18,0°
		500	0,11/−119,0°	0,05/75°	7,2/ 93°	0,62/−19,0°
		800	0,07/−177,0°	0,07/77°	4,6/ 82°	0,59/−23,0°
		1000	0,08/+ 138,0°	0,09/76°	3,8/ 76°	0,58/−25,0°
		1200	0,12/+ 118,0°	0,11/76°	3,2/ 71°	0,57/−28,0°
5	20	40	0,49/ −25,0°	0,01/78°	32,9/157°	0,94/ −9,0°
		200	0,22/ −82,0°	0,02/74°	15,9/112°	0,69/−17,0°
		500	0,09/−143,0°	0,05/78°	7,1/ 91°	0,61/−18,0°
		800	0,08/+ 160,0°	0,07/78°	4,5/ 80°	0,59/−22,0°
		1000	0,10/+ 130,0°	0,09/78°	3,7/ 75°	0,58/−24,0°
		1200	0,14/+ 115,0°	0,11/77°	3,1/ 69°	0,57/−28,0°
5	30	40	0,36/ −38,9°	0,01/76°	31,2/151°	0,90/−10,3°
		200	0,18/−122,0°	0,02/75°	14,0/106°	0,66/−14,0°
		500	0,15/−175,0°	0,05/80°	6,1/ 88°	0,61/−16,0°
		800	0,17/+ 148,0°	0,07/80°	3,9/ 78°	0,59/−21,0°
		1000	0,19/+ 131,0°	0,09/79°	3,1/ 72°	0,59/−24,0°
		1200	0,23/+ 119,0°	0,11/79°	2,7/ 67°	0,57/−28,0°

s parameters (common emitter)

V_{CE} V	I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
10	2	40	0,91/ −7,5°	0,01/84°	7,0/173°	1,00/ −2,6°
		200	0,81/ −36,0°	0,03/72°	6,3/149°	0,94/−12,0°
		500	0,54/ −78,0°	0,06/59°	4,6/118°	0,82/−21,0°
		800	0,35/−110,0°	0,08/58°	3,4/ 98°	0,74/−26,0°
		1000	0,27/−132,0°	0,08/59°	2,8/ 89°	0,72/−29,0°
		1200	0,22/−159,0°	0,09/61°	2,5/ 80°	0,69/−0,32°
10	5	40	0,81/ −11,1°	0,01/82°	14,4/169°	0,99/ −4,3°
		200	0,61/ −48,0°	0,03/69°	11,1/135°	0,86/−16,0°
		500	0,31/ −90,0°	0,05/66°	6,4/105°	0,71/−22,0°
		800	0,17/−120,0°	0,07/69°	4,3/ 90°	0,66/−25,0°
		1000	0,11/−148,0°	0,08/70°	3,5/ 82°	0,64/−27,0°
		1200	0,10/+ 167,0°	0,10/71°	3,0/ 76°	0,63/−30,0°
10	10	40	0,70/ −15,2°	0,01/80°	23,0/164°	0,97/ −6,1°
		200	0,42/ −58,0°	0,02/70°	14,8/124°	0,78/−17,0°
		500	0,17/ −95,0°	0,05/73°	7,3/ 97°	0,65/−20,0°
		800	0,07/−104,0°	0,07/75°	4,7/ 85°	0,62/−23,0°
		1000	0,04/−174,0°	0,09/75°	3,9/ 79°	0,61/−25,0°
		1200	0,07 + 120,0°	0,10/75°	3,3/ 73°	0,59/−28,0°
10	14	40	0,63/ −18,0°	0,01/79°	28,2/161°	0,96/ −7,2°
		200	0,34/ −63,0°	0,02/72°	15,9/119°	0,74/−17,0°
		500	0,13/ −98,0°	0,05/75°	7,5/ 95°	0,63/−19,0°
		800	0,05/−136,0°	0,07/77°	4,8/ 83°	0,61/−22,0°
		1000	0,04/+ 133,0°	0,09/76°	3,9/ 77°	0,60/−25,0°
		1200	0,08/+ 108,0°	0,10/76°	3,3/ 72°	0,58/−28,0°

Output voltage at d_{im} = −60 dB (see Figs 3 and 15)
(DIN 45004B, par. 6.3: 3-tone)
I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C
$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz
$V_q = V_o$ −6 dB ; f_q = 803,25 MHz
$V_r = V_o$ −6 dB ; f_r = 805,25 MHz
Measured at $f_{(p+q-r)}$ = 793,25 MHz V_o typ. 150 mV

Second harmonic distortion (see Figs 3 and 16)
I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C
V_p = 60 mV at f_p = 250 MHz
V_q = 60 mV at f_q = 560 MHz
measured at $f_{(p+q)}$ = 810 MHz d_2 typ. −50 dB

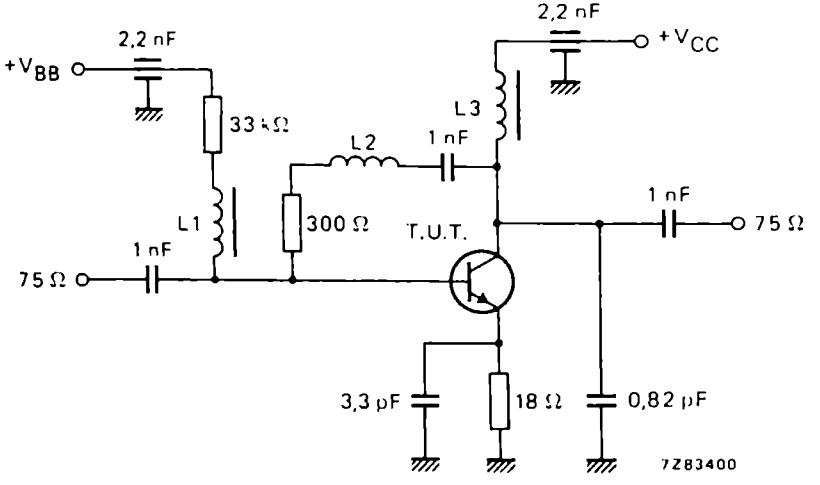


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH micro choke
L2 = 3 turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

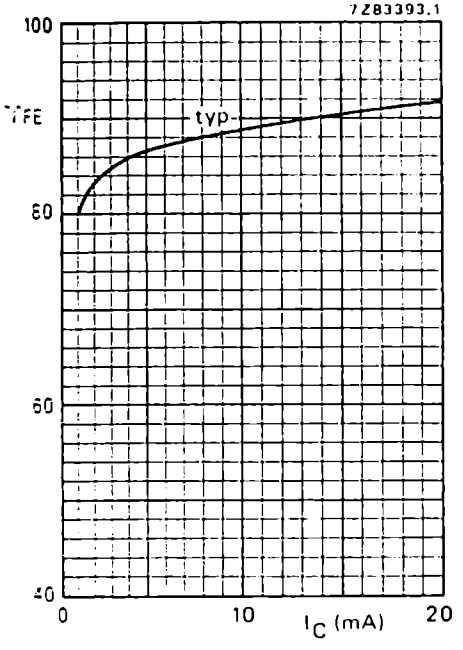


Fig. 4 V_{CE} = 10 V; T_j = 25 °C.

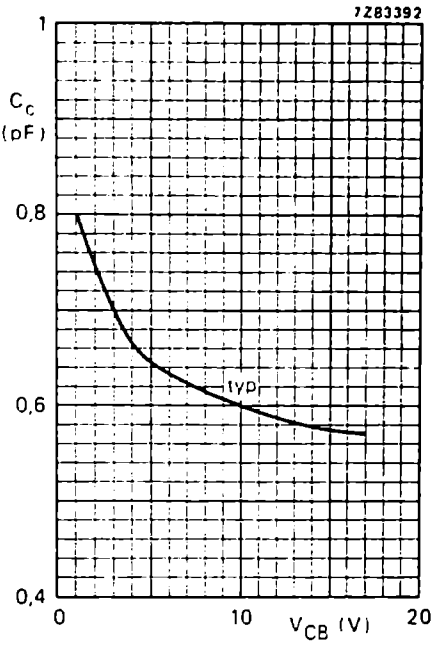


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

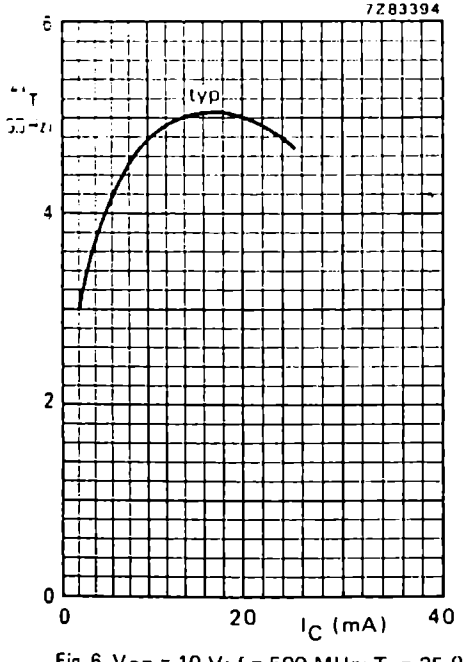


Fig. 6 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C.

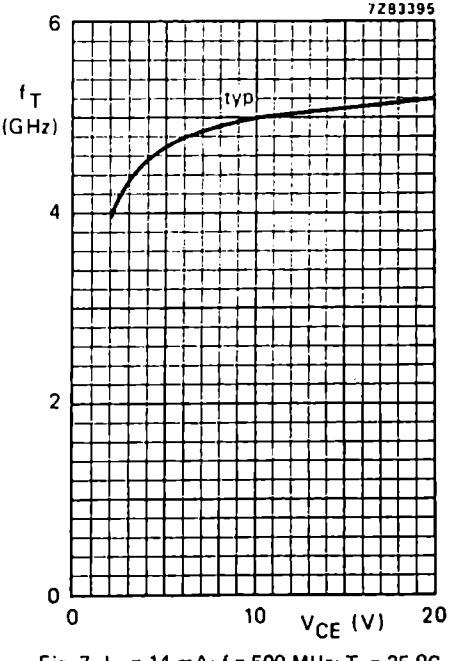


Fig. 7 I_C = 14 mA; f = 500 MHz; T_j = 25 °C.

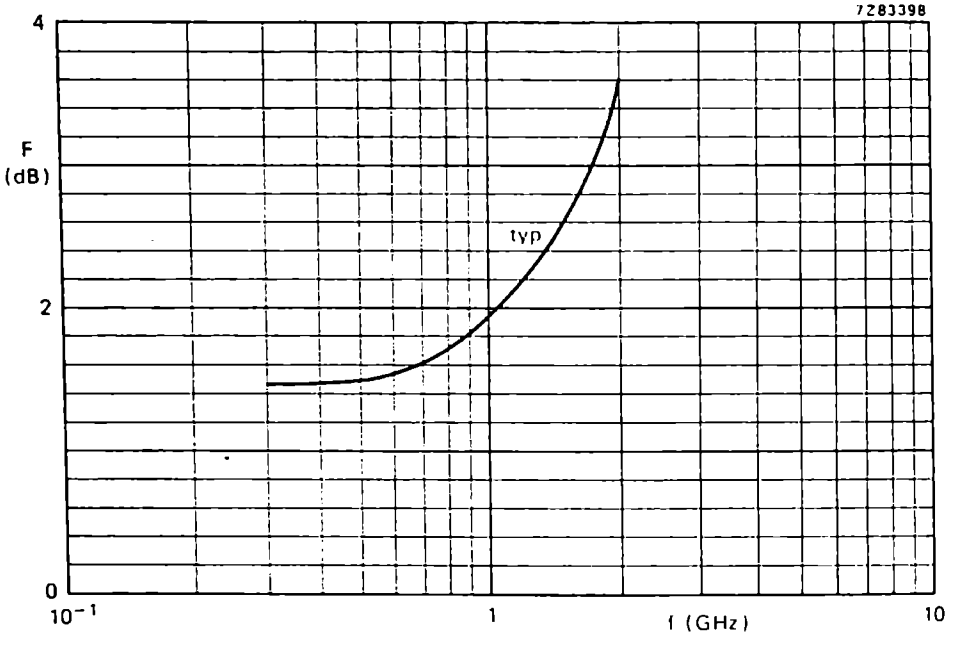


Fig. 8 V_{CE} = 10 V; I_C = 4 mA; Z_S = optimum; T_{amb} = 25 °C.

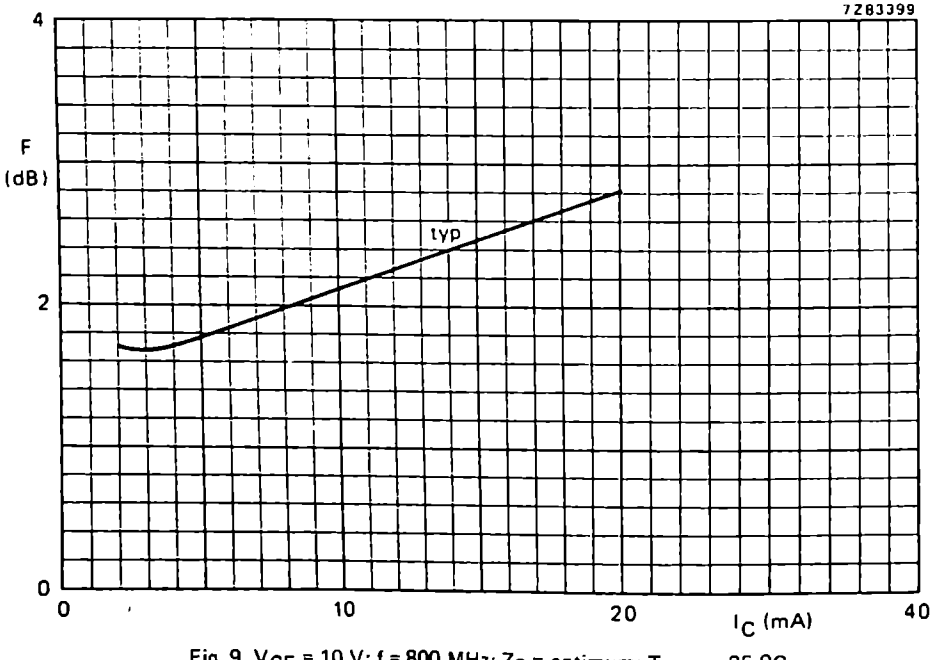


Fig. 9 V_{CE} = 10 V; f = 800 MHz; Z_S = optimum; T_{amb} = 25 °C.

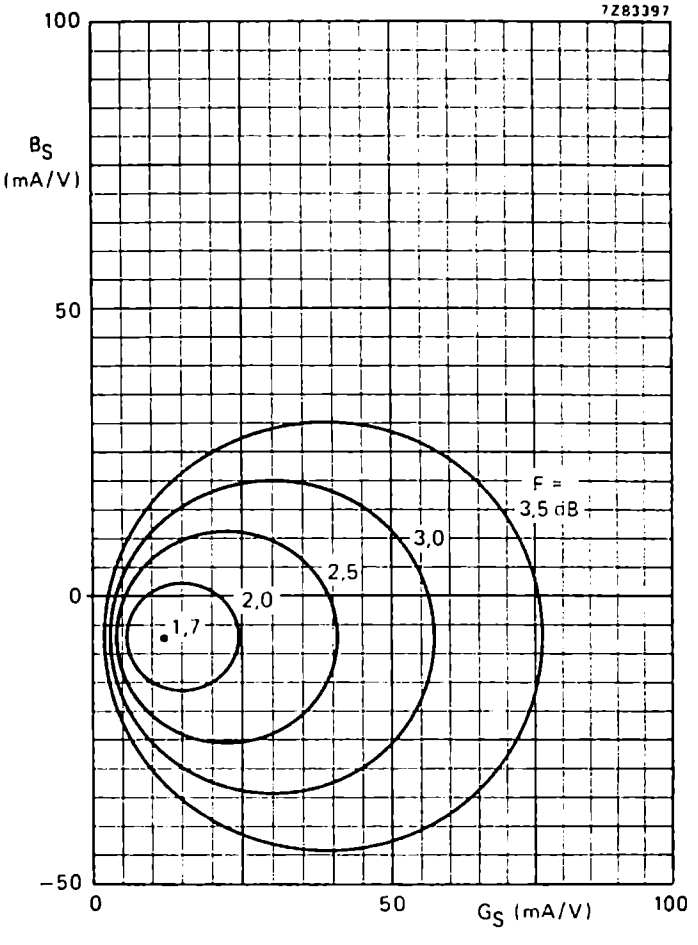


Fig. 10 Circles of constant noise figure.
V_{CE} = 10 V; I_C = 4 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

Conditions for Figs 11 and 12:

V_{CE} = 10 V; I_C = 14 mA;
T_{amb} = 25 °C.

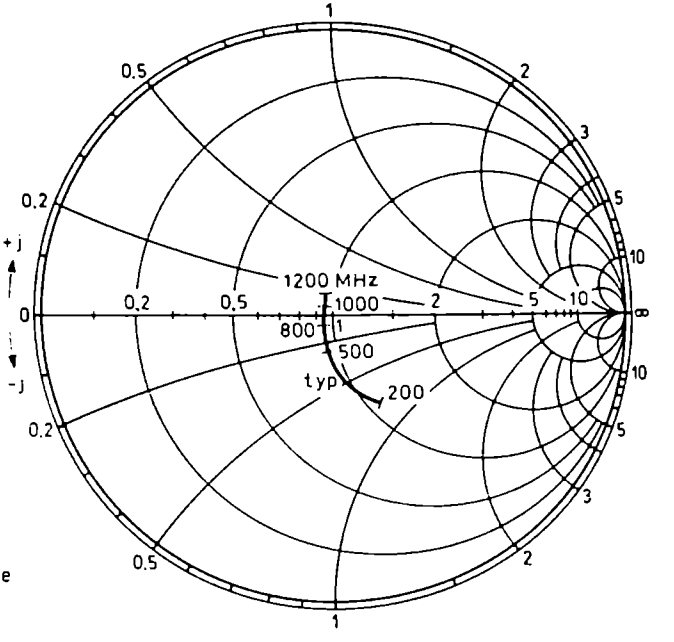


Fig. 11 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

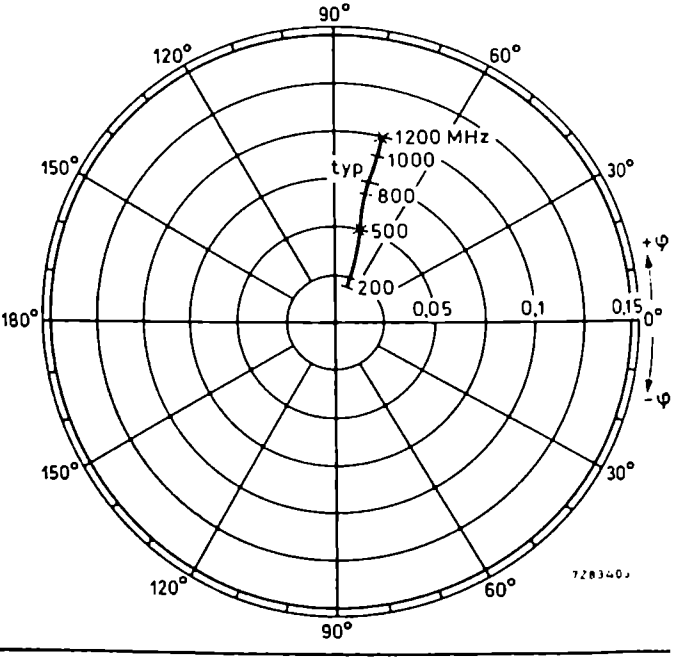


Fig. 12 Reverse transmission coefficient s_{re}.

Conditions for Figs 13 and 14:

V_{CE} = 10 V; I_C = 14 mA;
T_{amb} = 25 °C.

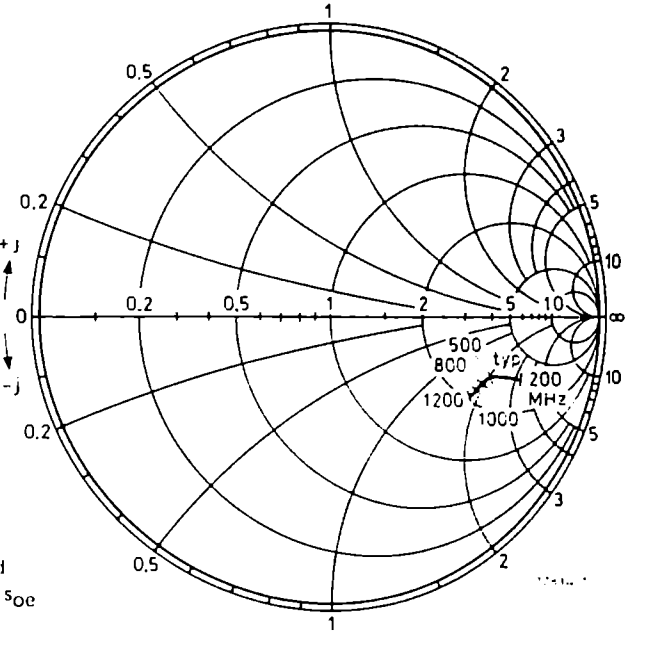


Fig. 13 Output impedance derived from output reflection coefficient s_{oe} and plotted in ohm x 50.

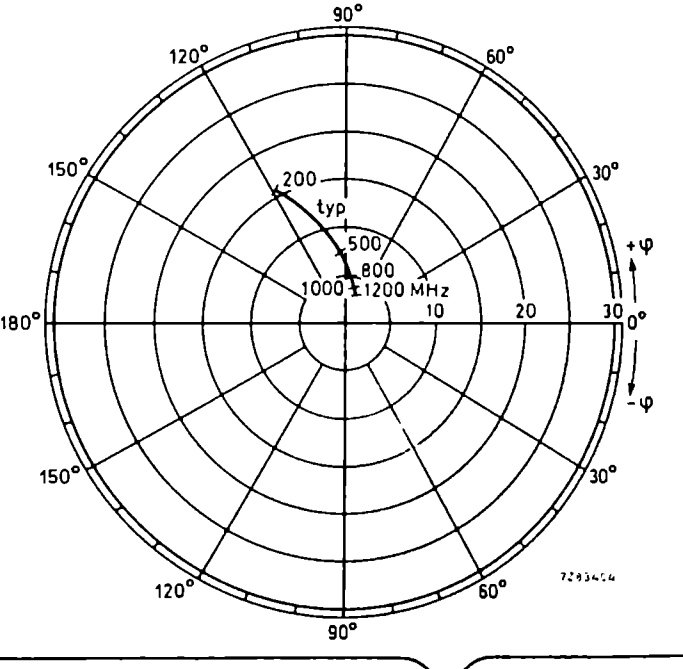


Fig. 14 Forward transmission coefficient s_{fe}.

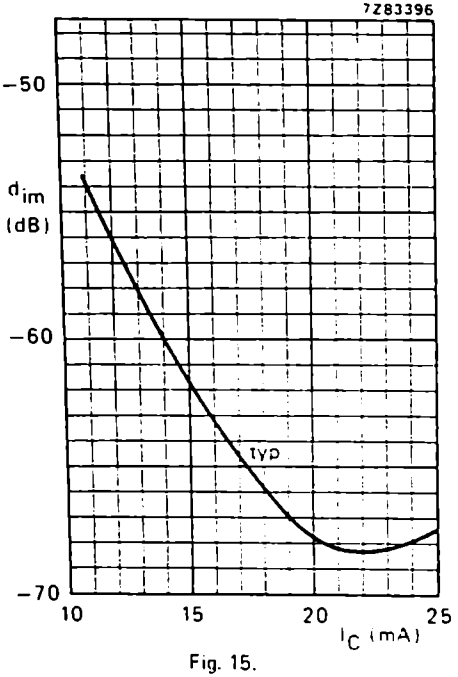


Fig. 15.

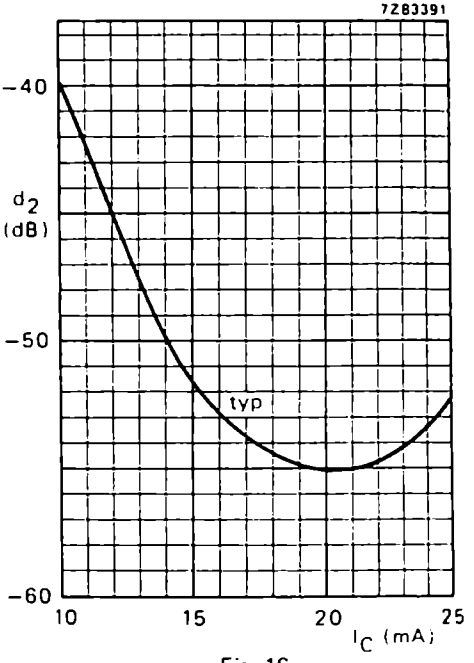


Fig. 16.

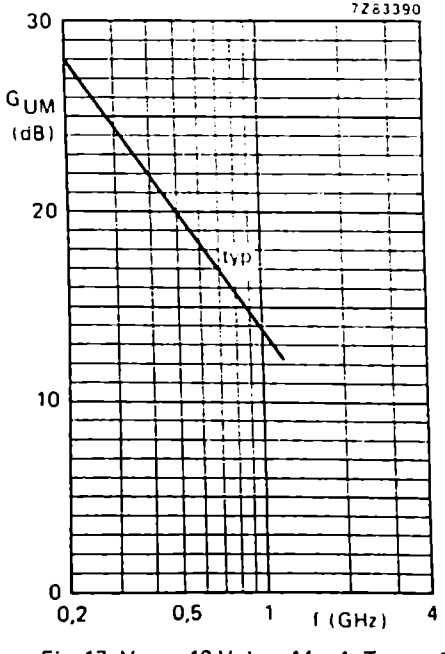


Fig. 17 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C.

Fig. 15 V_{CE} = 10 V; V_o = 43,5 dBmV = 150 mV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; measured in MATV test circuit (see Fig. 3).

Fig. 16 V_{CE} = 10 V; V_o = 60 mV, $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; measured in MATV test circuit (see Fig. 3).

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.

It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

This transistor features very low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15	V
Collector-emitter voltage (open base)	V_{CEO}	max.	12	V
Collector current (d.c.)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz				
I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,8	pF
Noise figure at optimum source impedance				
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9	dB
Max. unilateral power gain (see page 3)				
I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18	dB
Intermodulation distortion at T_{amb} = 25 °C				
I_C = 30 mA; V_{CE} = 5 V; R_L = 75 Ω; V_o = 300 mV				
(p + q − r) = 493,25 MHz (see page 4)	d_{im}	typ.	−60	dB

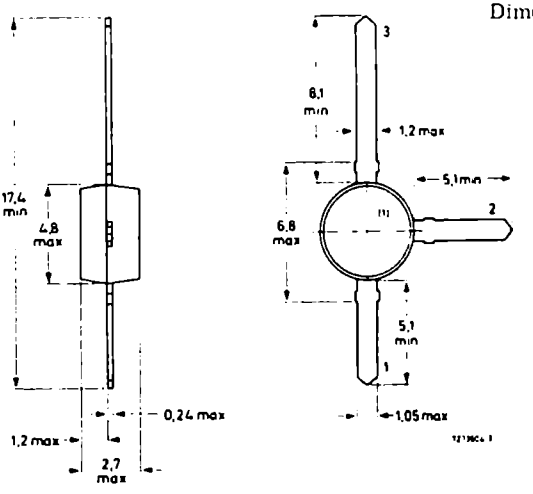
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

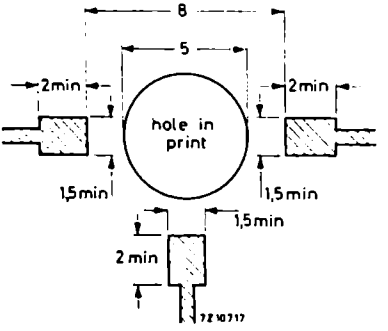
Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	15	V
Collector-emitter voltage (open base)	V_{CEO}	max.	12	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2.0	V
Current				
Collector current (d.c.)	I_C	max.	35	mA
Power dissipation				
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +150		°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air				
mounted on a glass-fibre print *) of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$		0.5	°C/mW

*) Requirements for glass-fibre print

(dimensions in mm)



CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50	nA
D.C. current gain [1]				
I_C = 30 mA; V_{CE} = 5 V	h_{FE}	>	40	
		typ.	90	
Transition frequency at f = 500 MHz [1]				
I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	0,7	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_e$ = 0; V_{EB} = 0.5 V	C_e	typ.	2,5	pF
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,8	pF
Noise figure at optimum source impedance				
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9	dB
Max. unilateral power gain (s_{re} assumed to be zero)				
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$				
I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18	dB

[1] Measured under pulse conditions.

CHARACTERISTICS (continued)

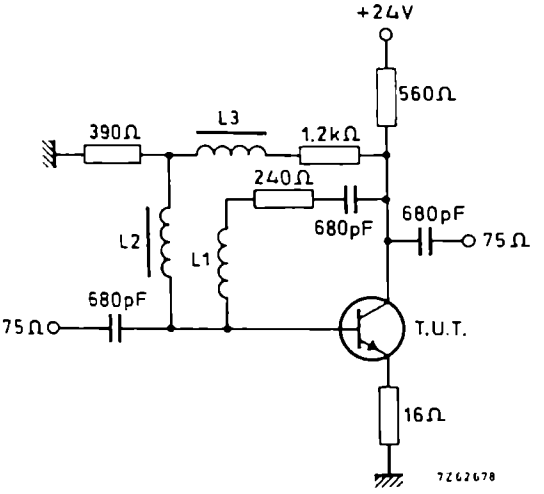
Intermodulation distortion at T_{amb} = 25 °C

I_C = 30 mA; V_{CE} = 5 V; R_L = 75 Ω; V.S.W.R. ≤ 2

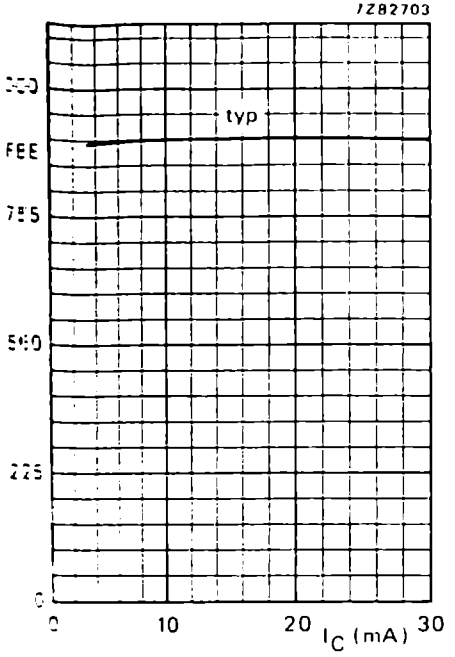
$V_p = V_o$ = 300 mV at f_p = 495.25 MHz
$V_q = V_o$ −6 dB at f_q = 503.25 MHz
$V_r = V_o$ −6 dB at f_r = 505.25 MHz

Measured at $f_{(p+q-r)}$ = 493.25 MHz d_{im} typ. −60 dB

Intermodulation test circuit:



L1 = 4 turns Cu wire (0.35) winding pitch 1 mm; int. diam. 4 mm
L2 and L3 5 μH (code number: 3122 108 20150)



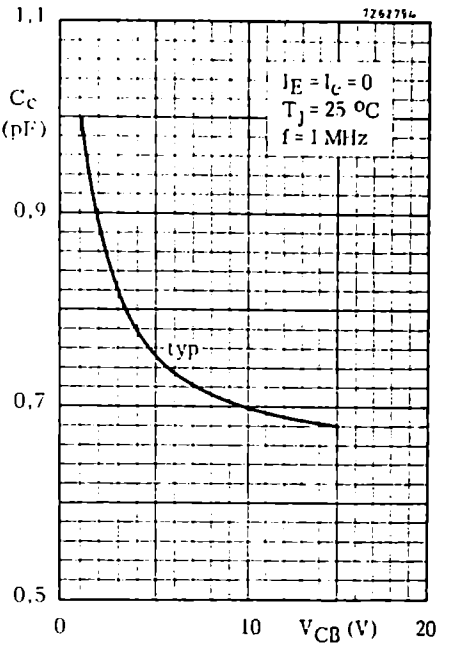
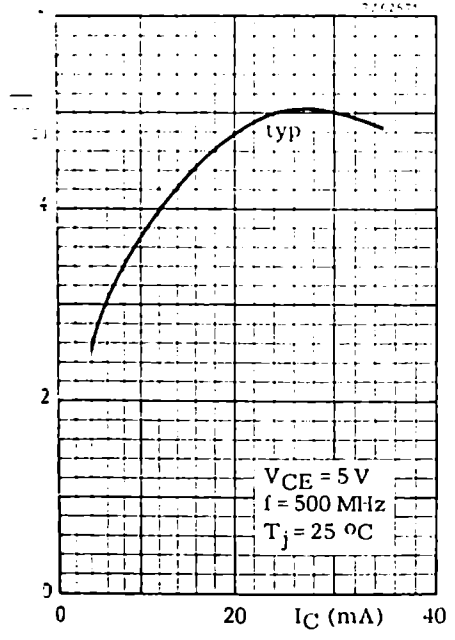
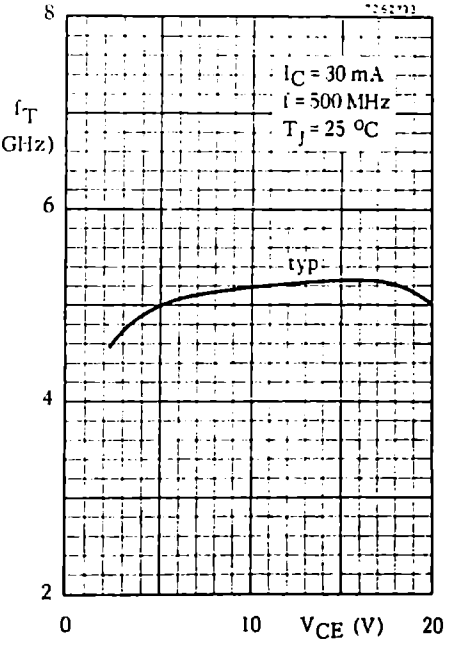
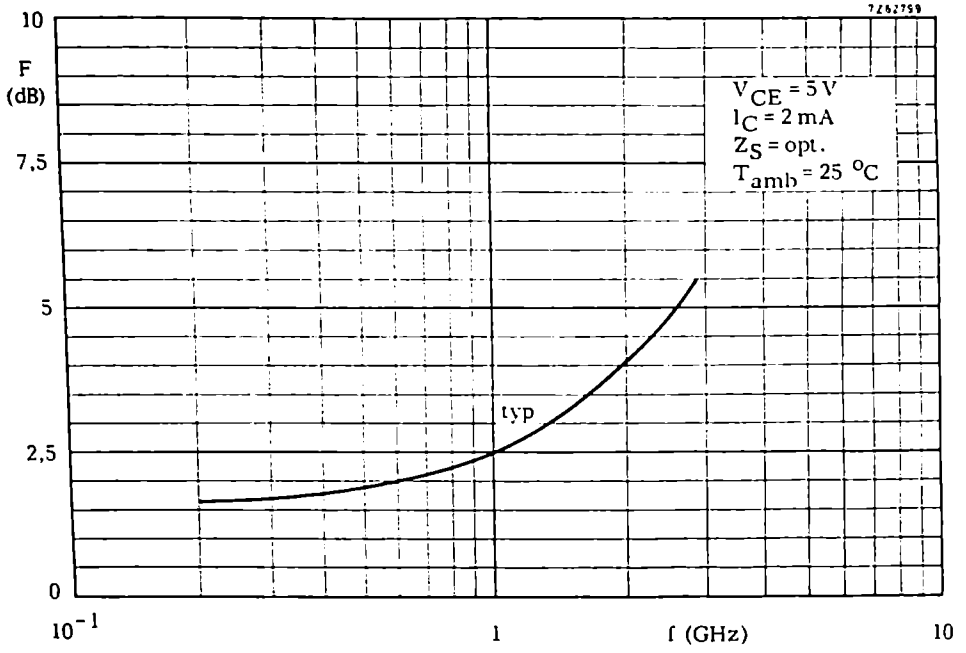
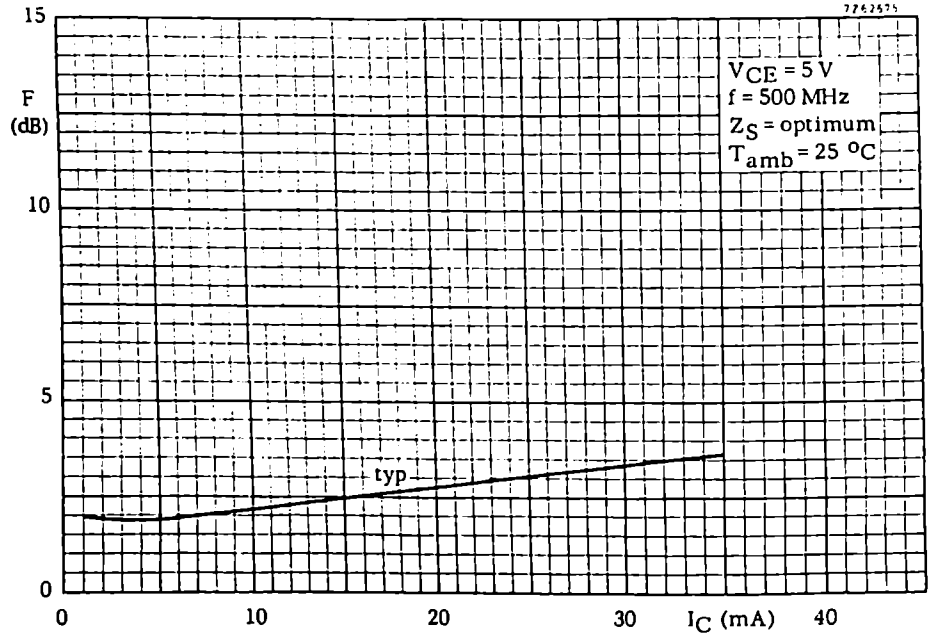


Fig. 4 V_{CE} = 5 V; T_j = 25 °C.






7262759
10
F
(dB)
7,5
5
2,5
0
V_{CE} = 5 V
I_C = 2 mA
Z_S = opt.
T_{amb} = 25 °C
typ
10^{-1}
1
f (GHz)
10


7262575
15
F
(dB)
10
5
0
V_{CE} = 5 V
f = 500 MHz
Z_S = optimum
T_{amb} = 25 °C
typ
0
10
20
30
I_C (mA)
40

circles of constant noise figure

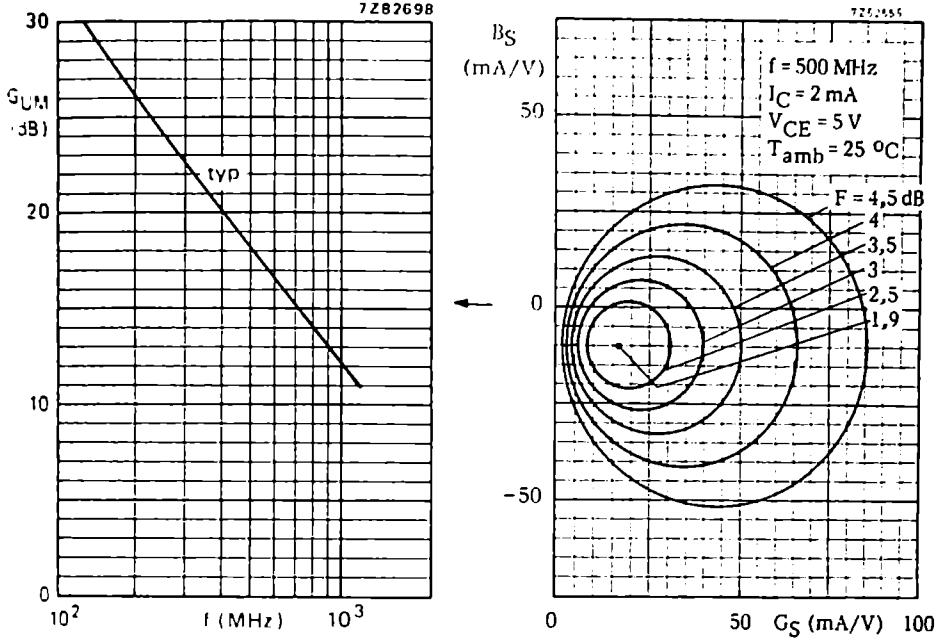


Fig. 10 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C.

SILICON PLANAR EPITAXIAL TRANSISTOR

NPN transistor in a subminiature plastic transfer-moulded T-package primarily intended for use in [illegible] and microwave amplifiers.

Features of this product:

- Low noise;
- Very low intermodulation distortion;
- High power gain;
- Gold metallization.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15	V
Collector-emitter voltage (open base)	V_{CEO}	max.	12	V
Collector current (d.c.)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,6	pF
Noise figure at optimum source impedance I_C = 4 mA; V_{CE} = 8 V; f = 800 MHz	F	typ.	1,6	dB
Maximum unilateral power gain I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	14	dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	425	mV

MECHANICAL DATA

SOT-37 (see Fig. 1).

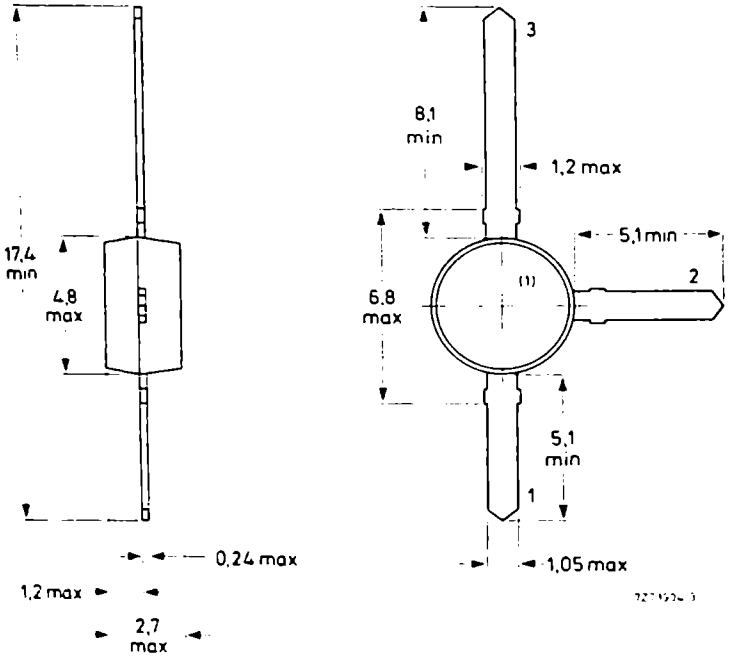
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2) of 40 mm x 25 mm x 1 mm

$R_{th\ j\text{-}a}$ = 300 K/W *

* K/W is SI unit for °C/W.

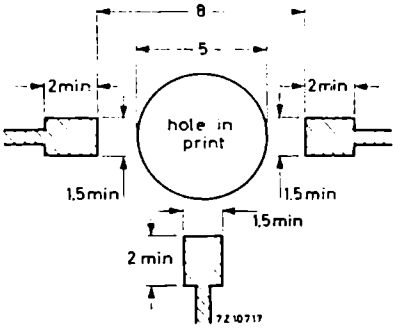


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

$I_E = 0$; $V_{CB} = 5$ V — I_{CBO} < 50 nA

D.C. current gain*

$I_C = 30$ mA; $V_{CE} = 5$ V — h_{FE} > 40, typ. 90

Transition frequency at f = 500 MHz*

$I_C = 30$ mA; $V_{CE} = 5$ V — f_T typ. 6 GHz

Collector capacitance at f = 1 MHz

$I_E = i_e = 0$; $V_{CB} = 5$ V — C_c typ. 0,9 pF

Emitter capacitance at f = 1 MHz

$I_C = i_c = 0$; $V_{EB} = 0{,}5$ V — C_e typ. 2,5 pF

Feedback capacitance at f = 1 MHz

$I_C = 0$; $V_{CE} = 5$ V; $T_{amb} = 25$ °C — C_{re} typ. 0,6 pF

Noise figure at optimum source impedance

$I_C = 4$ mA; $V_{CE} = 8$ V; f = 800 MHz — F typ. 1,6 dB

$I_C = 30$ mA; $V_{CE} = 8$ V; f = 800 MHz — F typ. 2,3 dB

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|s_{fe}|^2}{(1-|s_{ie}|^2)\,(1-|s_{oe}|^2)}$$

$I_C = 30$ mA; $V_{CE} = 8$ V; f = 800 MHz; $T_{amb} = 25$ °C — G_{UM} typ. 14 dB

* Measured under pulse conditions.

Output voltage at d_{im} = −60 dB (see Figs 3 and 14)
(DIN 45004B, par. 6.3: 3-tone)
I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; T_{amb} = 25 °C
$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz
$V_q = V_o$ −6 dB ; f_q = 803,25 MHz
$V_r = V_o$ −6 dB ; f_r = 805,25 MHz
Measured at $f_{(p+q-r)}$ = 793,25 MHz V_o typ. 425 mV

Output voltage at d_2 = −50 dB (see Figs 3 and 15)
I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; T_{amb} = 25 °C
$V_p = V_o$ at d_2 = −50 dB; f_p = 250 MHz
$V_q = V_o$ at d_2 = −50 dB; f_q = 560 MHz
measured at $f_{(p+q)}$ = 810 MHz V_o typ. 200 mV

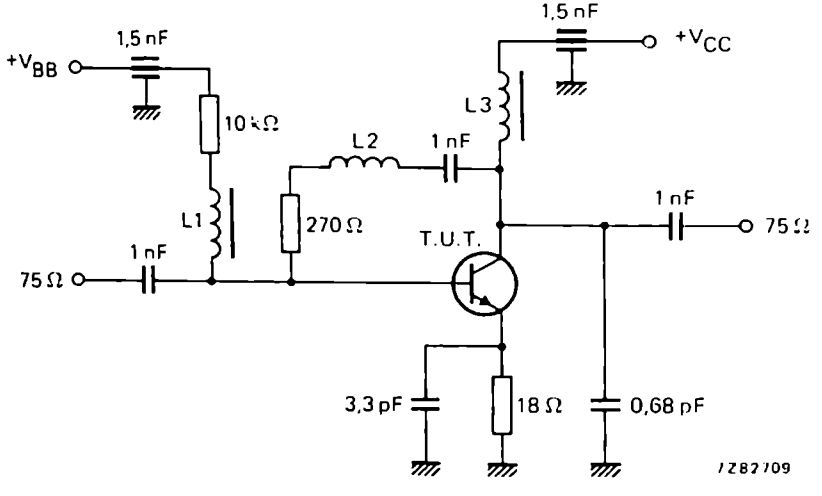


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH micro choke
L2 = 3 turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

S-parameters (common emitter) at V_{CE} = 8 V.

The figures given in the tables below can also be used for operation at V_{CE} = 5 V. Only slight differences from the s-parameters may occur.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
2	40	0,89/ −12,9°	0,01/75°	9,5/166°	0,97/ −6,1°
	100	0,85/ −30,7°	0,03/70,6°	8,7/155°	0,94/−13,5°
	200	0,75/ −57,1°	0,05/61,5°	7,4/138°	0,87/−22,5°
	500	0,48/−113°	0,08/50,9°	4,4/106°	0,72/−34,2°
	800	0,37/−153°	0,09/51,9°	3,0/ 86,3°	0,64/−40,0°
	1000	0,34/−178°	0,10/55,0°	2,6/ 77,0°	0,61/−47,8°
	1200	0,34/+ 159°	0,11/58,5°	2,2/ 68,0°	0,58/−53,9°
5	40	0,79/ −18,4°	0,01/74°	17,8/162°	0,94/ −9,1°
	100	0,71/ −42,1°	0,03/67,1°	15,2/146°	0,87/−19,5°
	200	0,57/ −72,8°	0,04/60,0°	11,5/126°	0,75/−28,7°
	500	0,31/−127°	0,07/60,1°	5,8/ 98,2°	0,59/−36,1°
	800	0,25/−168°	0,09/63,6°	3,8/ 82,0°	0,54/−41,0°
	1000	0,25/+ 165°	0,11/65,2°	3,2/ 74,4°	0,51/−46,7°
	1200	0,26/+ 141°	0,13/66,1°	2,7/ 66,7°	0,49/−52,2°
10	40	0,67/ −25,3°	0,01/71°	27,9/156°	0,90/−12,8°
	100	0,55/ −55,1°	0,02/65,1°	21,8/136°	0,78/−25,6°
	200	0,40/ −88,2°	0,04/62,4°	14,7/116°	0,62/−33,4°
	500	0,20/−141°	0,06/68,3°	6,7/ 93,0°	0,51/−35,9°
	800	0,16/+ 177°	0,09/70,0°	4,3/ 79,3°	0,48/−40,3°
	1000	0,18/+ 151°	0,12/69,7°	3,5/ 72,5°	0,46/−44,2°
	1200	0,21/+ 130°	0,14/68,9°	3,0/ 65,1°	0,43/−50,7°
20	40	0,51/ −34,7°	0,01/69°	39,7/149°	0,84/−17,4°
	100	0,38/ −70,5°	0,02/65,8°	27,7/126°	0,66/−29,5°
	200	0,26/−104°	0,03/68,0°	16,8/109°	0,51/−32,5°
	500	0,16/−158°	0,06/74,0°	7,3/ 89,3°	0,45/−33,4°
	800	0,14/+ 155°	0,10/73,6°	4,6/ 77,5°	0,42/−39,1°
	1000	0,17/+ 133°	0,12/72,3°	3,8/ 71,2°	0,41/−43,6°
	1200	0,21/+ 115°	0,14/70,5°	3,2/ 64,4°	0,39/−51,0°
30	40	0,46/ −36,5°	0,01/73°	43,3/150°	0,87/−16,9°
	100	0,32/ −73,7°	0,02/69,2°	29,1/124°	0,66/−27,2°
	200	0,20/−109°	0,03/72,0°	17,1/106°	0,50/−28,1°
	500	0,14/−174°	0,06/75,6°	7,4/ 87,2°	0,41/−31,7°
	800	0,15/+ 143°	0,10/74,7°	4,8/ 74,9°	0,39/−41,0°
	1000	0,17/+ 124°	0,12/72,9°	3,9/ 70,5°	0,38/−42,8°
	1200	0,21/+ 111°	0,15/71,0°	3,3/ 63,8°	0,37/−51,0°

Conditions for Figs 4 and 5:
V_{CE} = 8 V; I_C = 30 mA;
T_{amb} = 25 °C.

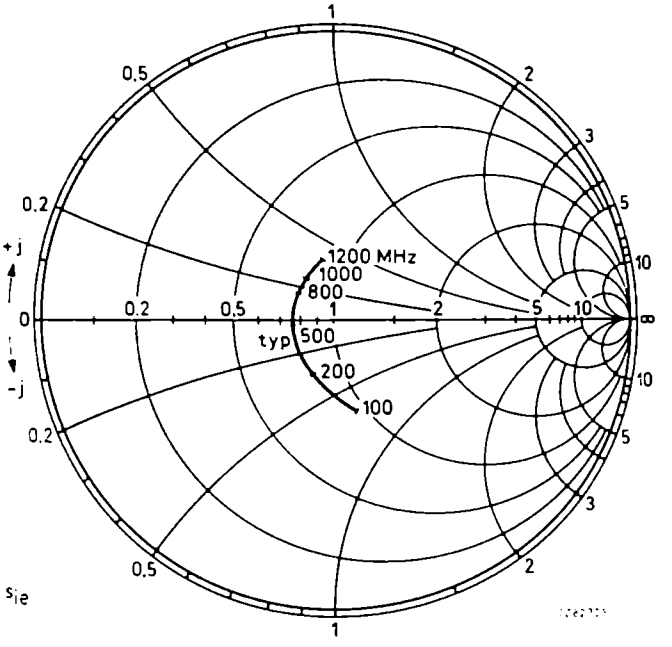


Fig. 4 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

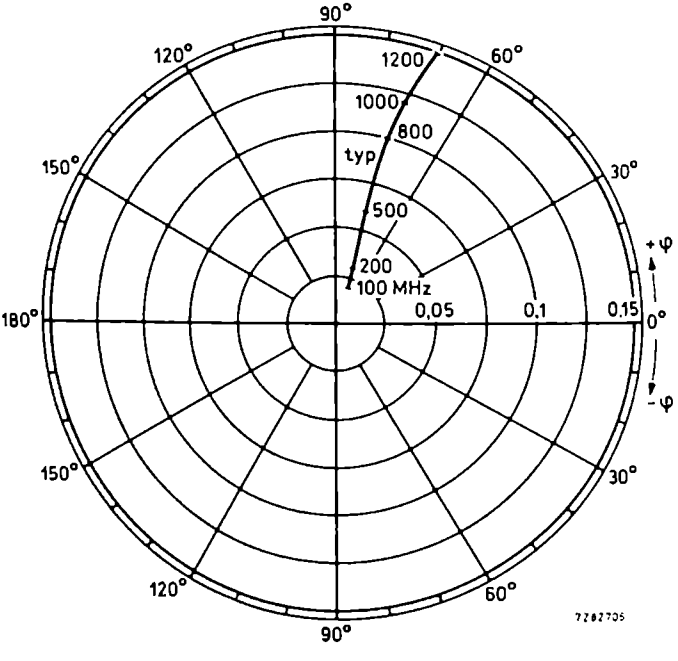


Fig. 5 Reverse transmission coefficient s_{re}.

Conditions for Figs 6 and 7:

V_{CE} = 8 V; I_C = 30 mA;
T_{amb} = 25 °C.

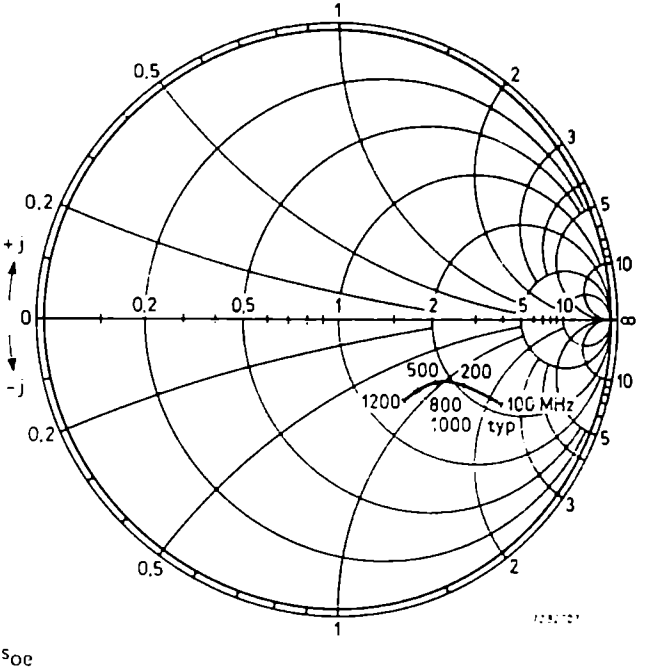


Fig. 6 Output impedance derived from output reflection coefficient s_{oe} (admittances in ohm x 50).

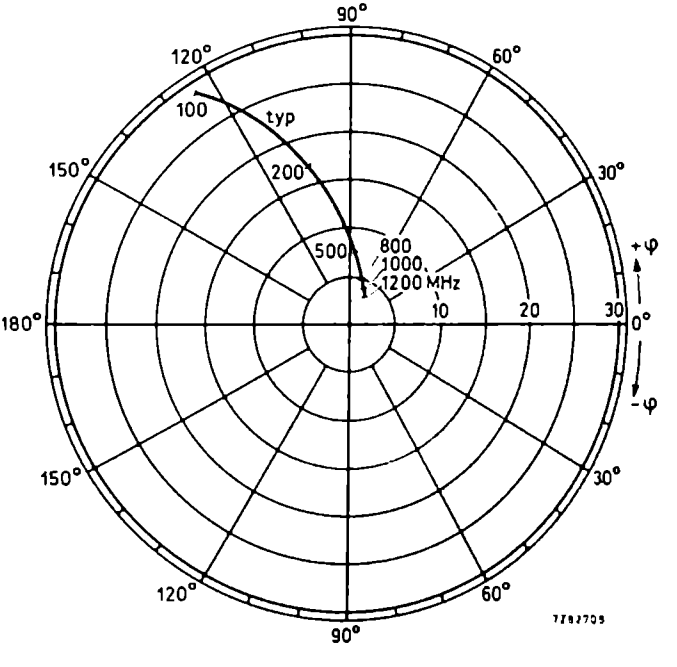


Fig. 7 Forward transmission coefficient s_{fe}.

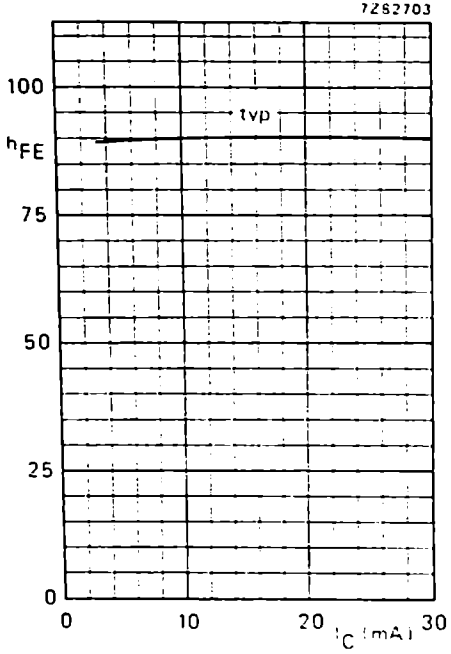


Fig. 8 V_{CE} = 5 V; T_j = 25 °C.

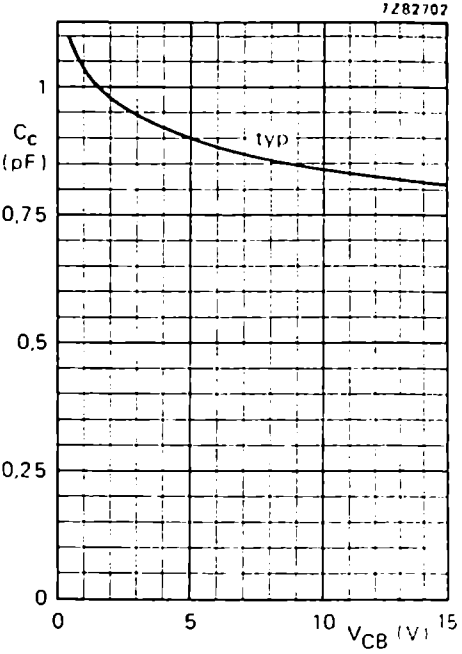


Fig 9 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

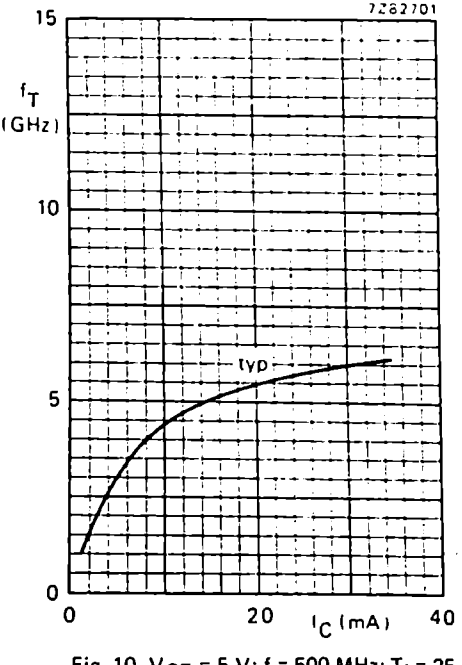


Fig. 10 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C.

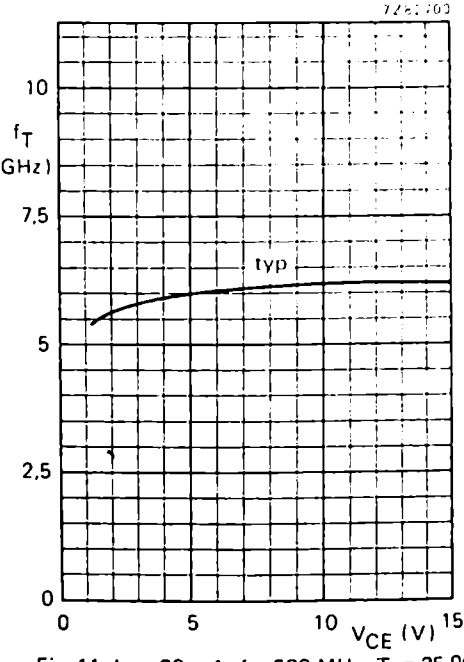


Fig. 11 I_C = 30 mA; f = 500 MHz; T_j = 25 °C

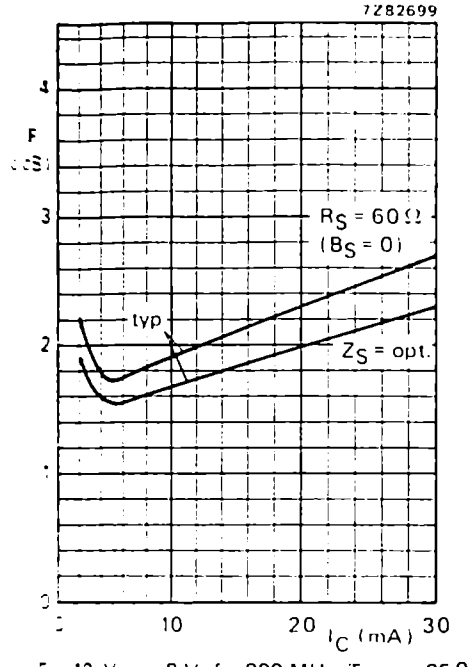


Fig. 12 V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C.

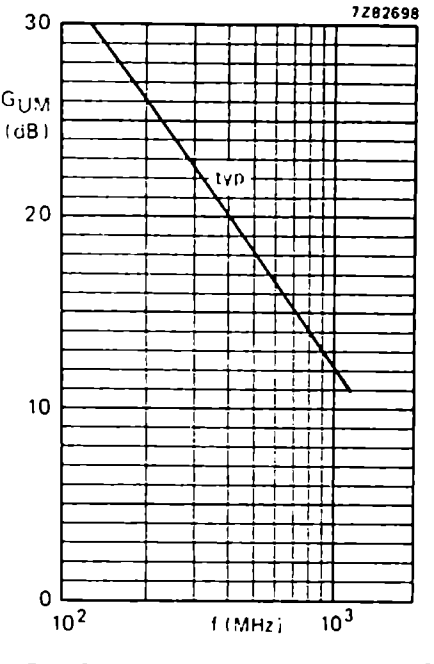


Fig. 13 V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

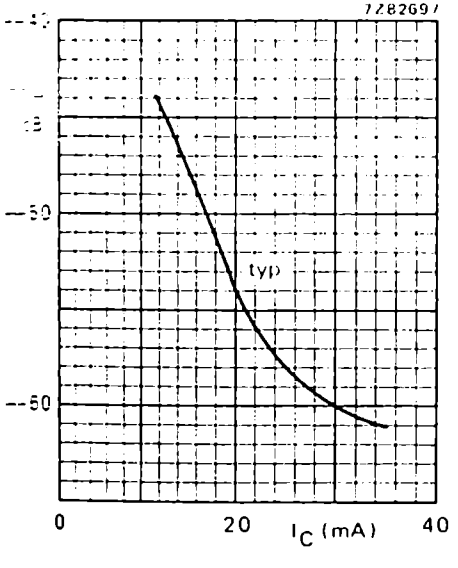


Fig. 14 V_{CE} = 8 V; V_o = 425 mV = 52,6 dBmV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; measured in MATV test circuit (see Fig. 3).

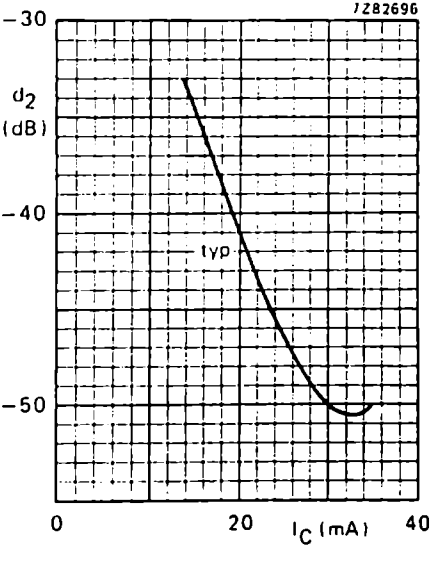


Fig. 15 V_{CE} = 8 V; V_o = 200 mV = 46 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; measured in MATV test circuit (see Fig. 3).

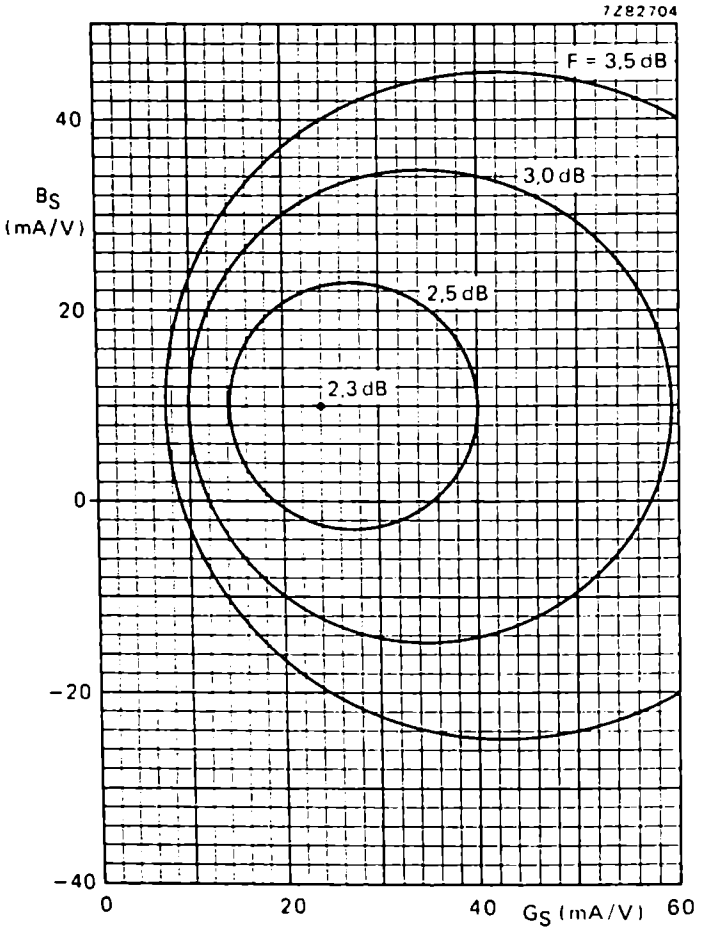


Fig. 16 Circles of constant noise figure.
V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz;
T_{amb} = 25 °C; typical values.

SILICON PLANAR EPITAXIAL TRANSISTOR

N.P.N resistance-stabilized transistor in a SOT-48 capstan envelope featuring extremely low cross modulation, intermodulation and second harmonic distortion. Thanks to its high transition frequency it has a high power gain in conjunction with good wideband properties and low noise up to high frequencies.

It is primarily intended for CATV and MATV applications.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_h = 145 °C; f > 1 MHz	P_{tot}	max.	3,5 W
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 90 mA; V_{CE} = 20 V	f_T	typ.	3,5 GHz
Cross modulation distortion (channel 13) I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_{cm}	typ. <	−61 dB −57 dB
I_C = 90 mA; V_{CE} = 20 V; V_o = 32 dBmV	d_{cm}	typ. <	−93 dB −89 dB
Intermodulation distortion at $f_{(p+q-r)}$ = 194,25 MHz I_C = 90 mA; V_{CE} = 20 V; V_o = 60 dBmV	d_{im}	typ.	−63 dB
Broadband power gain I_C = 90 mA; V_{CE} = 20 V	G_p	> typ.	10 dB 11 dB
Noise figure at f = 200 MHz I_C = 90 mA; V_{CE} = 20 V	F	typ. <	8 dB 10 dB
2nd harmonic distortion at $f_p + f_q$ = 210 MHz I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_2	<	−56 dB

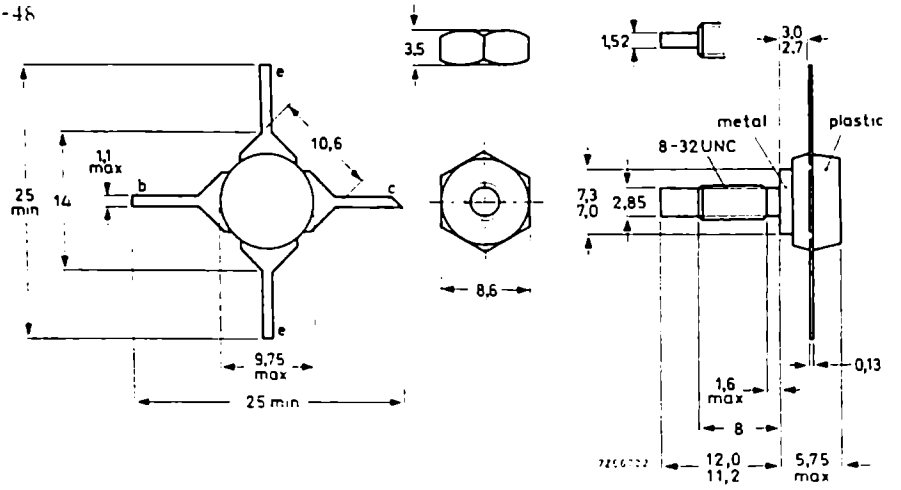
MECHANICAL DATA (see page 2)

CAUTION. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end. De-burring must leave surface flat: do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	35	V
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V

Currents

Collector current (d.c.)	I_C	max.	150	mA
Collector current (peak value); f > 1 MHz	I_{CM}	max.	300	mA

Power dissipation

Total power dissipation (d.c.) up to T_h = 160 °C	P_{tot}	max.	2,5	W
Total power dissipation up to T_h = 145 °C; f > 1 MHz	P_{tot}	max.	3,5	W

Temperatures

Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	15	°C/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	°C/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 20 V	I_{CBO}	<	50	μA	

D.C. current gain

I_C = 50 mA; V_{CE} = 20 V	h_{FE}	>	30		1)
I_C = 150 mA; V_{CE} = 20 V	h_{FE}	>	30		1)

Transition frequency at f = 500 MHz

I_C = 90 mA; V_{CE} = 20 V	f_T	typ.	3.5	GHz	1)
I_C = 150 mA; V_{CE} = 20 V	f_T	typ.	3.5	GHz	1)

Collector capacitance at f = 1 MHz

$I_E = I_e$ = 0; V_{CB} = 20 V	C_c	typ.	3.5	pF	

Emitter capacitance at f = 1 MHz

$I_C = I_c$ = 0; V_{EB} = 0.5 V	C_e	typ.	12	pF	

Feedback capacitance at f = 1 MHz

I_C = 10 mA; V_{CE} = 20 V	C_{re}	typ.	1.3	pF	

Collector-stud capacitance at f = 1 MHz

	C_{cs}	typ.	2	pF	

Noise figure at optimum source impedance

I_C = 90 mA; V_{CE} = 20 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	5	dB	1)

Maximum unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

I_C = 90 mA; V_{CE} = 20 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	13.5	dB	

1) Measured under pulse conditions.

CHARACTERISTICS (continued)

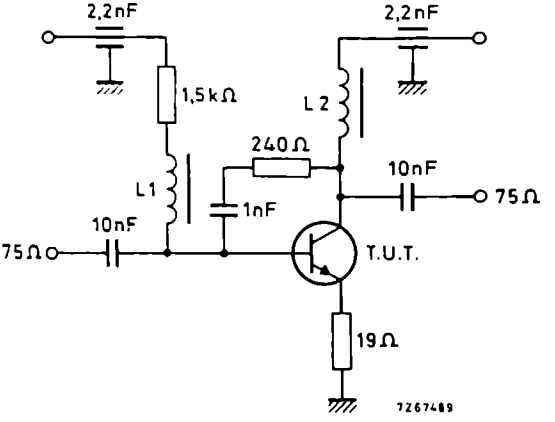
Intermodulation distortion at T_{amb} = 25 °C

I_C = 90 mA; V_{CE} = 20 V; R_L = 75 Ω

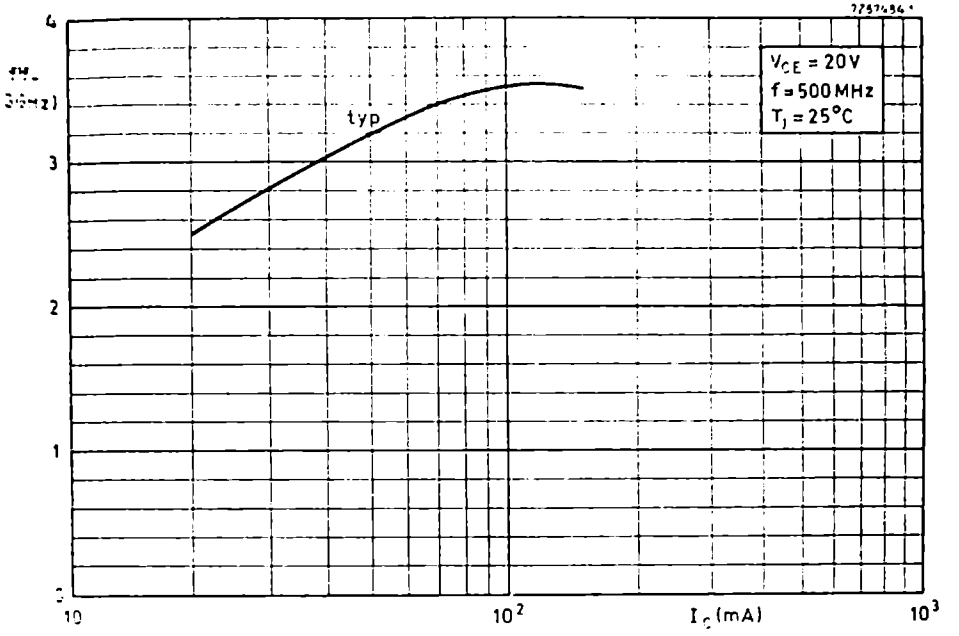
$V_p = V_o$ −60 mV at f_p = 495.25 MHz
$V_q = V_o$ −6 dB at f_q = 503.25 MHz
$V_r = V_o$ −6 dB at f_r = 505.25 MHz

Measured at $f_{(p+q-r)}$ = 493.25 MHz d_{im} typ. −60 dB

MATV test circuit



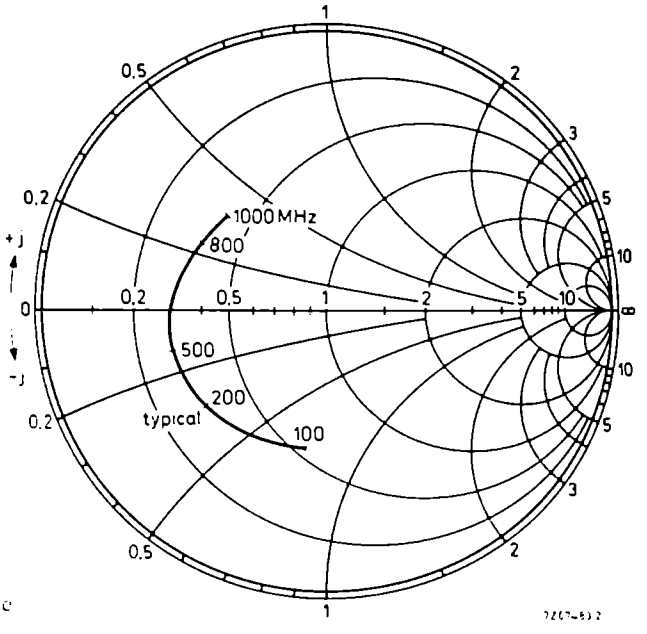
L1 L2 = 5 μH ferrocube coil (code number: 3122 108 20153)


7237484
4
3
2
1
0
typ
V_{CE} = 20V
f = 500 MHz
T_j = 25°C
10^2
I_C (mA)
10^3

V_{CE} = 20 V

I_C = 90 mA

T_{amb} = 25 °C

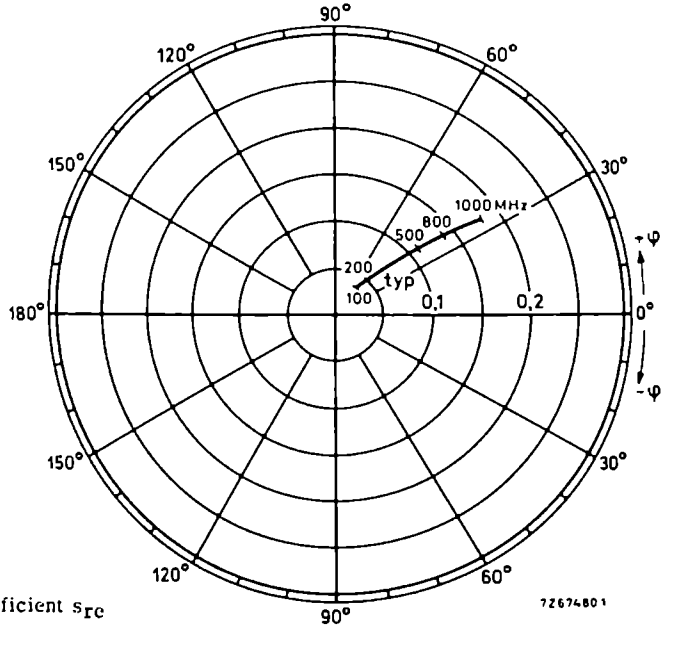


Input reflection coefficient s_{ie}

V_{CE} = 20 V

I_C = 90 mA

T_{amb} = 25 °C

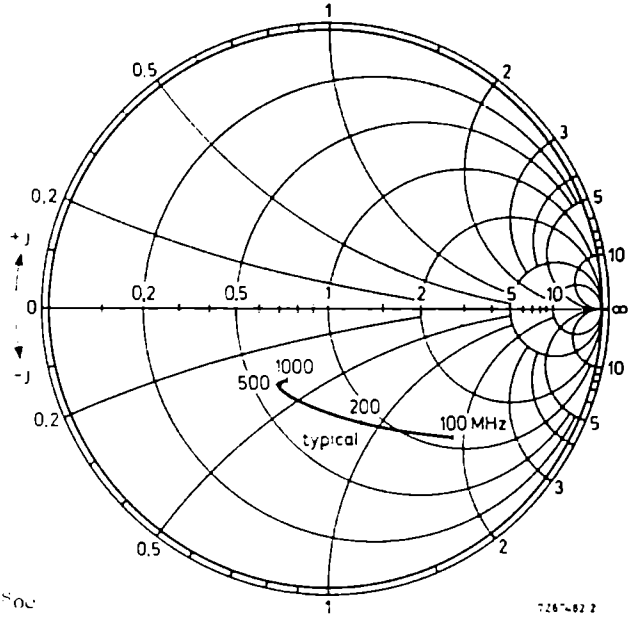


Reverse transmission coefficient s_{re}

V_{CE} = 20 V

I_C = 90 mA

T_{amb} = 25 °C

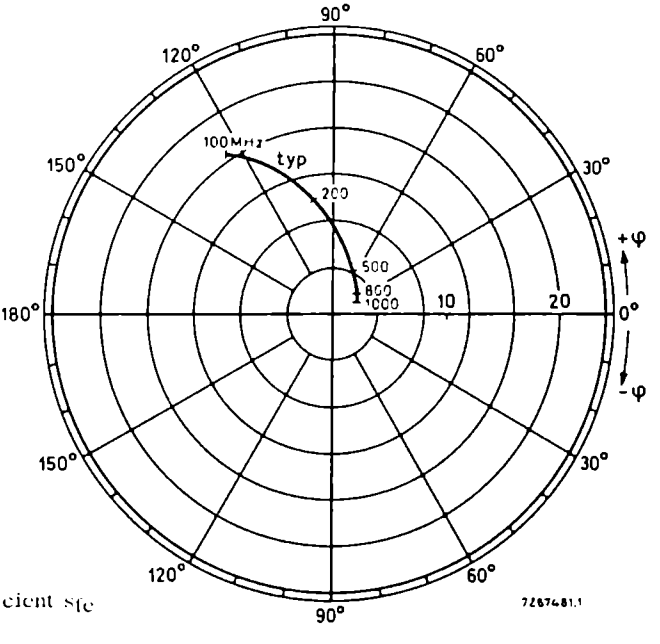


Output reflection coefficient s_{oe}

V_{CE} = 20 V

I_C = 90 mA

T_{amb} = 25 °C



Forward transmission coefficient s_{fe}

APPLICATION INFORMATION (see page 9) T_{amb} = 25 °C unless otherwise specified

Cross modulation distortion (channel 13) [1]

I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_{cm}	typ.	−61	dB
		<	−57	dB
I_C = 90 mA; V_{CE} = 20 V; V_o = 32 dBmV	d_{cm}	typ.	−93	dB
		<	−89	dB

Intermodulation distortion

I_C = 90 mA; V_{CE} = 20 V; R_L = 75 Ω

$V_p = V_o$ = 60 dBmV at f_p = 196,25 MHz
$V_q = V_o$ −6 dB at f_q = 203,25 MHz
$V_r = V_o$ −6 dB at f_r = 205,25 MHz

Measured at $f_{(p+q-r)}$ = 194,25 MHz	d_{im}	typ.	−63	dB

Broadband power gain

I_C = 90 mA; V_{CE} = 20 V	G_p	>	10	dB
		typ.	11	dB

Noise figure

I_C = 90 mA; V_{CE} = 20 V; f = 200 MHz	F	typ.	8	dB
		<	10	dB

2nd harmonic distortion

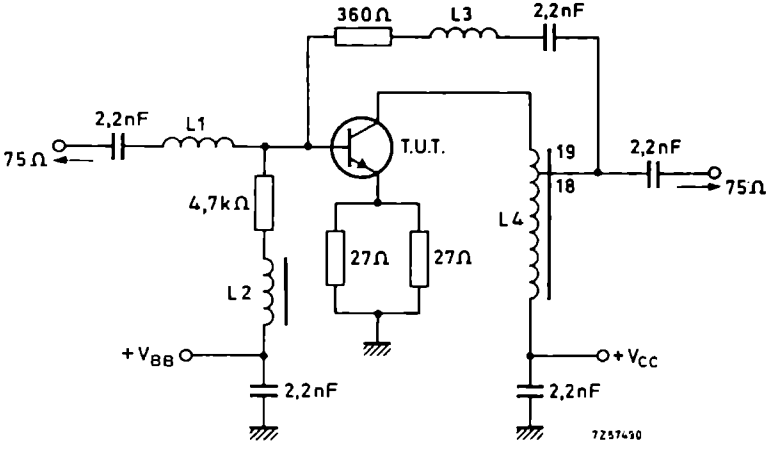
I_C = 90 mA; V_{CE} = 20 V

f_p = 66 MHz; f_q = 144 MHz; $f_p + f_q$ = 210 MHz; V_o = 48 dBmV	d_2	<	−56	dB

1) In 12-channel measuring equipment; channel 13 unmodulated.
V_o = output level/signal, according to NCTA measuring standard.

APPLICATION INFORMATION (continued)

CATV test circuit



Frequency range 40 to 300 MHz (flatness gain ±0.2 dB)			
Return losses input and output		<	−16 dB
Power gain	G_p	typ.	11 dB

L1 2 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 3 mm
L2 5 μH ferroxcube coil (code number 3122 108 20153)
L3 5 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 4.7 mm
L4 19 turns enamelled Cu wire (0,3 mm) on ferroxcube core (code no. 4322 020 91001)

APPLICATION INFORMATION (see page 9) T_{amb} = 25 °C unless otherwise specified

Cross modulation distortion (channel 13) [1]

I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_{cm}	typ.	−61	dB
		<	−57	dB
I_C = 90 mA; V_{CE} = 20 V; V_o = 32 dBmV	d_{cm}	typ.	−93	dB
		<	−89	dB

Intermodulation distortion

I_C = 90 mA; V_{CE} = 20 V; R_L = 75 Ω

$V_p = V_o$ = 60 dBmV at f_p = 196,25 MHz
$V_q = V_o$ −6 dB at f_q = 203,25 MHz
$V_r = V_o$ −6 dB at f_r = 205,25 MHz

Measured at $f_{(p+q-r)}$ = 194,25 MHz	d_{im}	typ.	−63	dB

Broadband power gain

I_C = 90 mA; V_{CE} = 20 V	G_p	≥	10	dB
		typ.	11	dB

Noise figure

I_C = 90 mA; V_{CE} = 20 V; f = 200 MHz	F	typ.	8	dB
		<	10	dB

2nd harmonic distortion

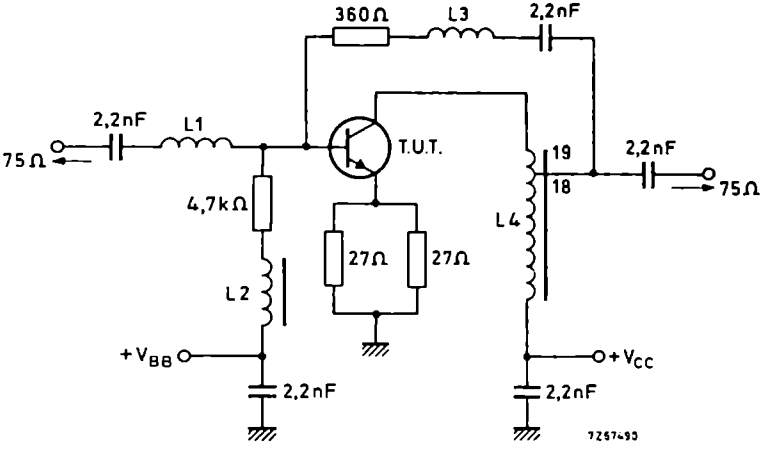
I_C = 90 mA; V_{CE} = 20 V

f_p = 66 MHz; f_q = 144 MHz; $f_p + f_q$ = 210 MHz; V_o = 48 dBmV	d_2	<	−56	dB

1) In 12-channel measuring equipment; channel 13 unmodulated.
V_o = output level/signal, according to NCTA measuring standard.

APPLICATION INFORMATION (continued)

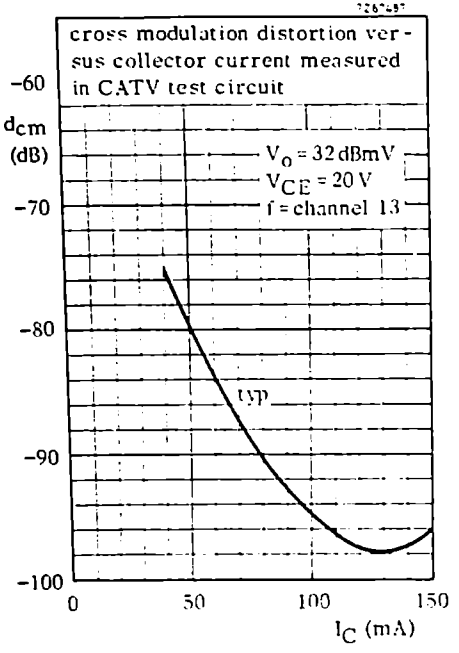
CATV test circuit

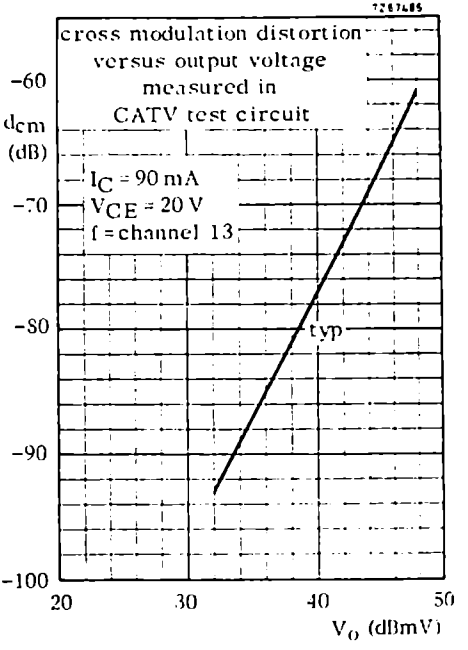


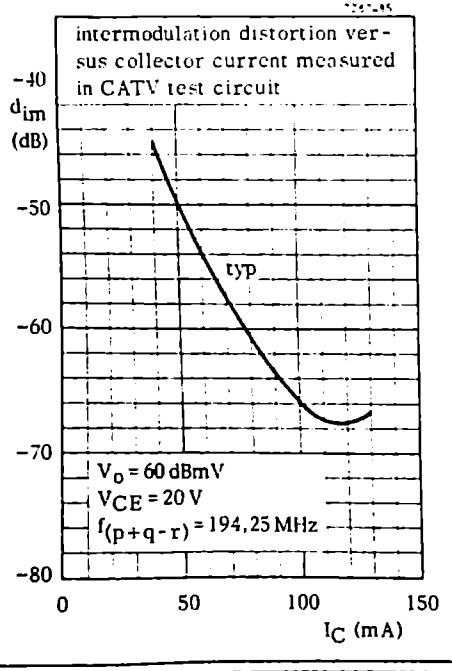
Frequency range 40 to 300 MHz (flatness gain ±0,2 dB)			
Return losses input and output		<	−16 dB
Power gain	G_p	typ.	11 dB

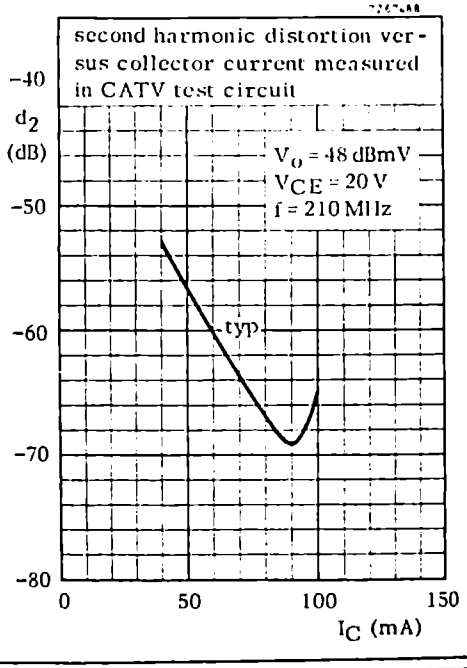
L1 2 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 3 mm
L2 5 µH ferroxcube coil (code number 3122 108 20153)
L3 5 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 4,7 mm
L4 19 turns enamelled Cu wire (0,3 mm) on ferroxcube core (code no. 4322 020 91001)

APPLICATION INFORMATION (continued)









SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N resistance stabilized transistor in a TO-39 metal envelope.

Due to very linear characteristics the transistor features low cross modulation, intermodulation and second harmonic distortion. Thanks to its high transition frequency it has a high power gain combined with excellent wideband properties and low noise up to high frequencies.

The BFR95 is primarily intended for CATV and MATV applications.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	1,5 W
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 80 mA; V_{CE} = 20 V	f_T	typ.	3,5 GHz
Cross modulation distortion (channel 13) I_C = 80 mA; V_{CE} = 18 V; V_o = 48 dBmV	d_{cm}	typ. <	−61 dB −57 dB
I_C = 80 mA; V_{CE} = 18 V; V_o = 32 dBmV	d_{cm}	typ. <	−93 dB −89 dB
Intermodulation distortion at $f_{(p+q-r)}$ = 194,25 MHz I_C = 80 mA; V_{CE} = 18 V; V_o = 60 dBmV	d_{im}	typ.	−64 dB
Broadband power gain I_C = 80 mA; V_{CE} = 18 V	G_p	> typ.	8 dB 9 dB
Noise figure at f = 200 MHz I_C = 80 mA; V_{CE} = 18 V	F	typ. <	9 dB 10 dB
Second harmonic distortion at $f_{(p+q)}$ = 210 MHz I_C = 80 mA, V_{CE} = 18 V; V_o = 48 dBmV	d_2	typ.	−62 dB

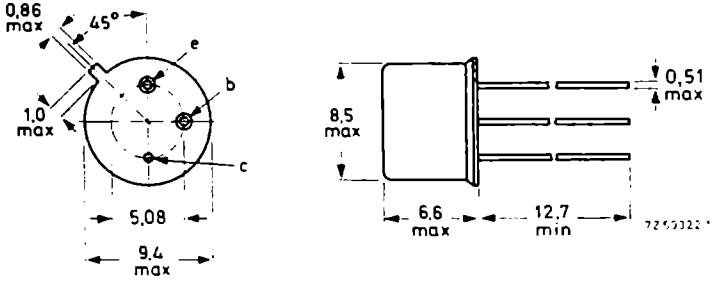
MECHANICAL DATA see page 2.

MECHANICAL DATA

Fig. 1 TO-39

Collector connected to case

Dimensions in mm



Maximum lead diameter guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) note 1	V_{CBO}	max.	30	V
Collector-emitter voltage (R_{BE} = 10 Ω) note 2	V_{CER}	max.	35	V
Collector-emitter voltage (open base) note 2	V_{CEO}	max.	25	V
Emitter-base voltage (open collector) note 3	V_{EBO}	max.	3	V
Collector current (d.c.)	I_C	max.	150	mA
Collector current (peak value); f > 1 MHz	I_{CM}	max.	300	mA
Total power dissipation				
up to T_{amb} = 25 °C	P_{tot}	max.	0,7	W
up to T_{mb} = 125 °C	P_{tot}	max.	1,5	W
Storage temperature	T_{stg}		−65 to + 200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE (note 4)

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	250	K/W
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50	K/W

Notes

1. At I_C = 100 μA.
2. At I_C = 10 mA.
3. At I_E = 100 μA.
4. K/W is SI unit for °C/W.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 20 V	I_{CBO}	<	50 μA
D.C. current gain (note 1)			
I_C = 50 mA; V_{CE} = 20 V	h_{FE}	>	30
I_C = 150 mA; V_{CE} = 20 V	h_{FE}	>	30
Transition frequency at f = 500 MHz (note 1)			
I_C = 80 mA; V_{CE} = 20 V	f_T	typ.	3,5 GHz
I_C = 150 mA; V_{CE} = 20 V	f_T	typ.	3,5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 20 V	C_c	typ.	3,5 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 20 V	C_{re}	typ.	1,5 pF

APPLICATION INFORMATION (see also test circuit on page 4)

Measuring conditions: I_C = 80 mA; V_{CE} = 18 V; T_{amb} = 25 °C

Cross modulation (channel 13) (note 2)			
V_o = 48 dBmV	d_{cm}	typ. <	−61 dB −57 dB
V_o = 32 dBmV	d_{cm}	typ. <	−93 dB −89 dB
Intermodulation distortion			
$V_p = V_o$ − 60 dBmV at f_p = 196,25 MHz $V_q = V_o$ −6 dB at f_q = 203,25 MHz $V_r = V_o$ −6 dB at f_r = 205,25 MHz			
Measured at $f_{(p+q-r)}$ = 194,25 MHz	d_{im}	typ.	−64 dB
Broadband power gain	G_p	> typ.	8 dB 9 dB
Noise figure at f = 200 MHz	F	typ. <	9 dB 10 dB
2nd harmonic distortion at $f_{(p+q)}$ = 210 MHz f_p = 66 MHz; f_q = 144 MHz; V_o = 48 dBmV	d_2	typ. <	−62 dB −56 dB

Notes

1. Measured under pulse conditions.
2. In 12-channel measuring equipment; channel 13 unmodulated.
   V_o = output level/signal, in accordance with NCTA measuring standard.

APPLICATION INFORMATION

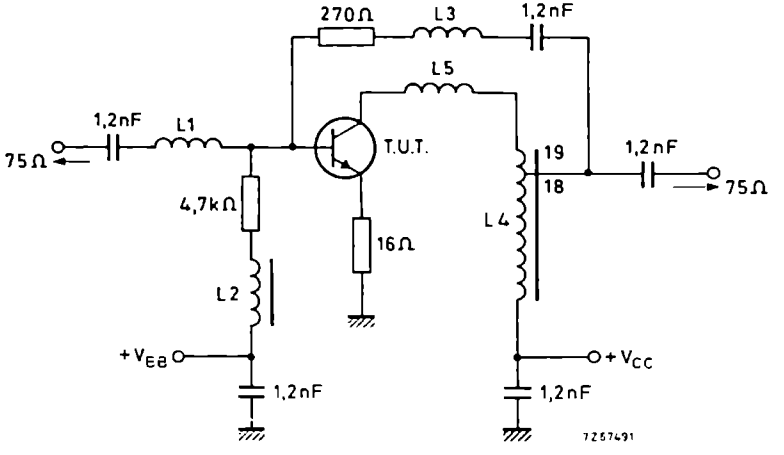


Fig. 2 CATV test circuit.
Frequency range 40 to 300 MHz
Power gain G_p typ. 9 dB

L1 = 2 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 3 mm
L2 = 5 μH Ferroxcube coil (cat. no. 3122 108 20153)
L3 = 3 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 4,7 mm
L4 = 19 turns enamelled Cu wire (0,3 mm) on Ferroxcube core (cat. no. 4322 020 91001)
L5 = 2 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 3 mm.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.
It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers, etc.
The transistor features very low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	75	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz				
I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz				
I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	≤	1,4	pF
Noise figure at optimum source impedance				
I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3,3	dB
Max. unilateral power gain (see page 3)				
I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,2	dB
Intermodulation distortion at T_{amb} = 25 °C				
I_C = 50 mA; V_{CE} = 10 V; R_L = 75 Ω; V_o = 500 mV				
$f_{(p+q-r)}$ = 493,25 MHz (see page 4)	d_{im}	typ.	−60	dB

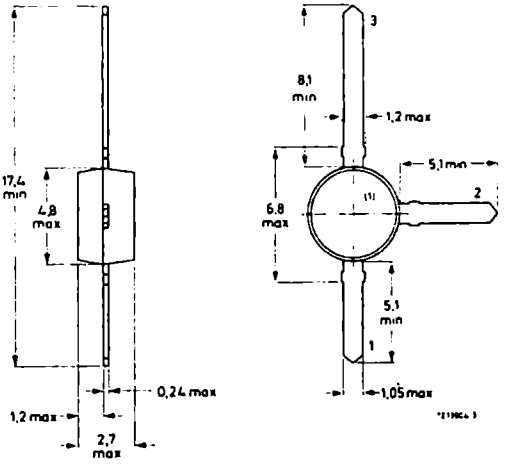
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

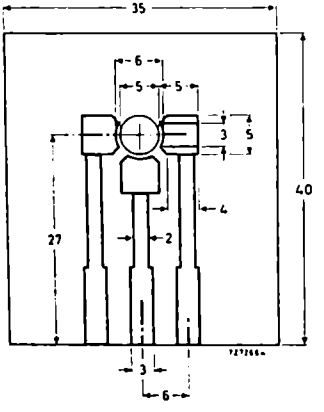
RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3.0	V
Currents				
Collector current (d.c.)	I_C	max.	75	mA
Collector current (peak value); f > 1 MHz	I_{CM}	max.	150	mA
Power dissipation				
Total power dissipation up to T_{amb} = 60 °C mounted on a fibre-glass print of 40 mm x 35 mm x 1.5 mm	P_{tot}	max.	500	mW
Temperatures				
Storage temperature	T_{stg}		−65 to + 175	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 35 mm x 1.5 mm	$R_{th\ j\text{-}a}$	=	0.23	°C/mW

Requirements for fibre-glass print Dimensions in mm



Single-sided 35 µm Cu-clad epoxy fibre-glass print, thickness 1.5 mm.
Tracks are fully tin-lead plated.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 10 V	I_{CBO}	<	100	nA

D.C. current gain [1])

I_C = 50 mA; V_{CE} = 10 V	h_{FE}	>	25	
		typ.	50	
I_C = 75 mA; V_{CE} = 10 V	h_{FE}	>	25	
		typ.	52	

Transition frequency at f = 500 MHz [1])

I_C = 50 mA; V_{CE} = 10 V	f_T	>	4,0	GHz
		typ.	5,0	GHz
I_C = 75 mA; V_{CE} = 10 V	f_T	>	4,4	GHz
		typ.	5,5	GHz

Collector capacitance at f = 1 MHz

$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	1,3	pF

Emitter capacitance at f = 1 MHz

$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	6,5	pF

Feedback capacitance at f = 1 MHz

I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1,0	pF
		<	1,4	pF

Noise figure at optimum source impedance

I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3,3	dB
I_C = 50 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	3,8	dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,2	dB

[1]) Measured under pulse conditions.

CHARACTERISTICS (continued)

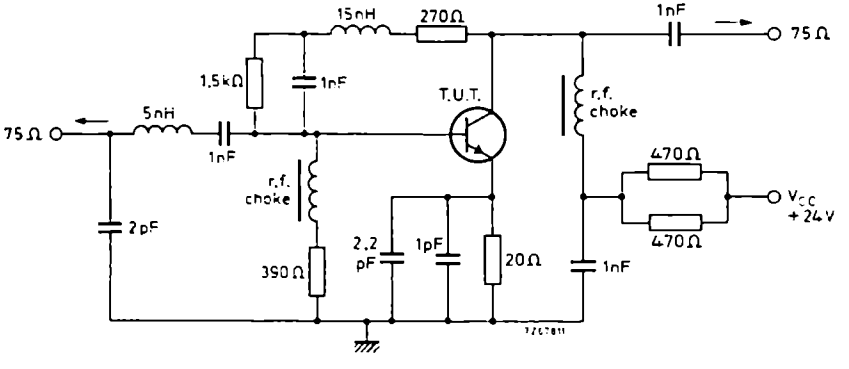
Intermodulation distortion at T_{amb} = 25 °C

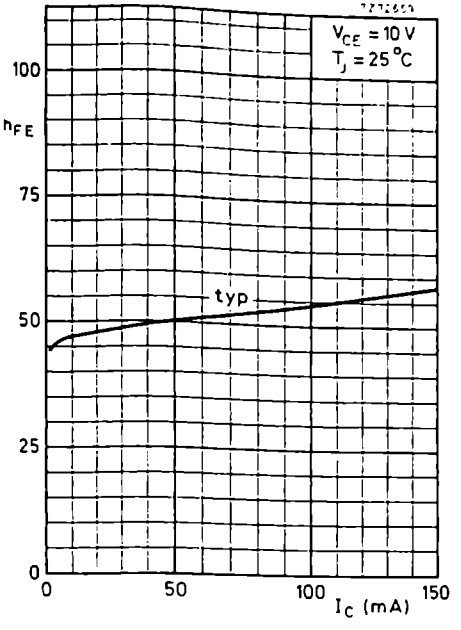
I_C = 50 mA; V_{CE} = 10 V; R_L = 75 Ω

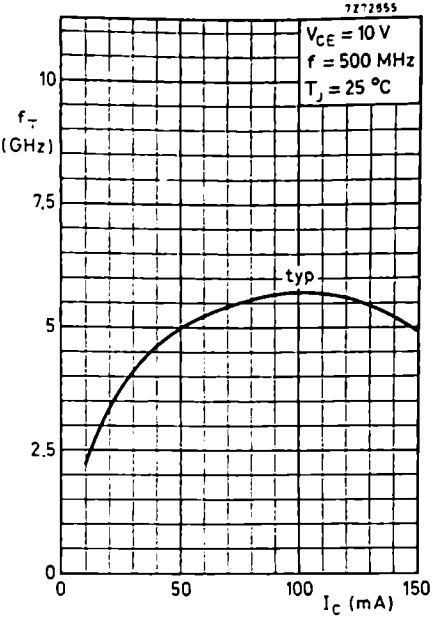
$V_p = V_o$ = 500 mV at f_p = 495.25 MHz
$V_q = V_o$ − 6 dB at f_q = 503.25 MHz
$V_r = V_o$ − 6 dB at f_r = 505.25 MHz

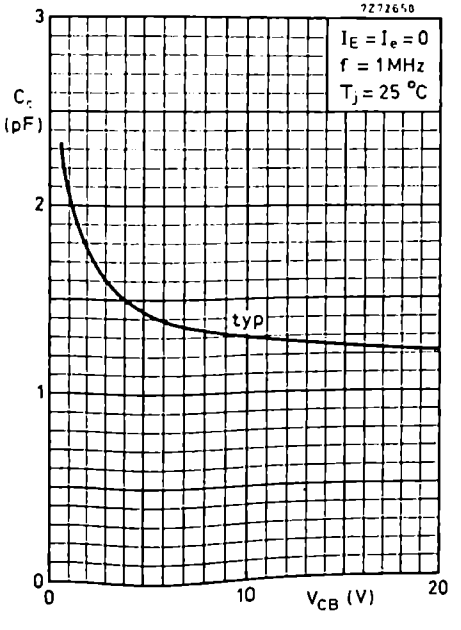
Measured at $f_{(p+q-r)}$ = 493.25 MHz d_{im} typ. −60 dB

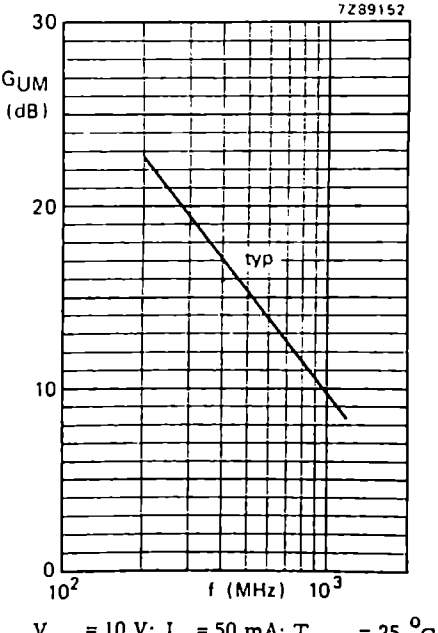
Intermodulation test circuit:









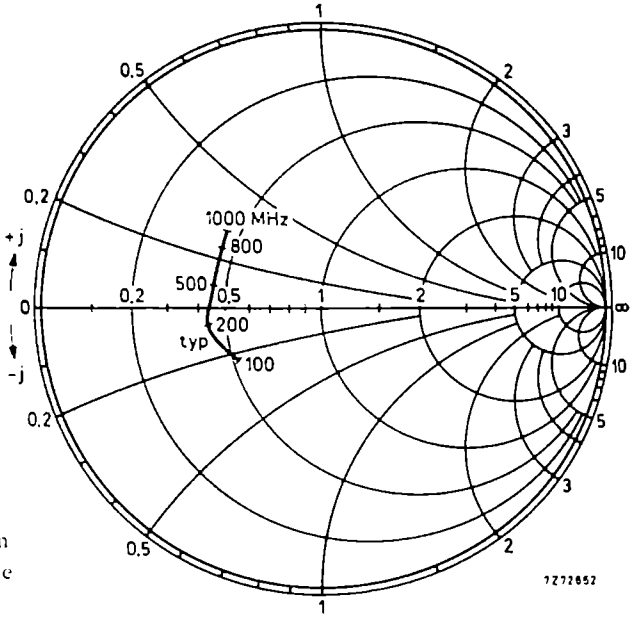


V_{CE} = 10 V; I_C = 50 mA: T_{amb} = 25 °C.

V_{CE} = 10 V

I_C = 50 mA

T_{amb} = 25 °C

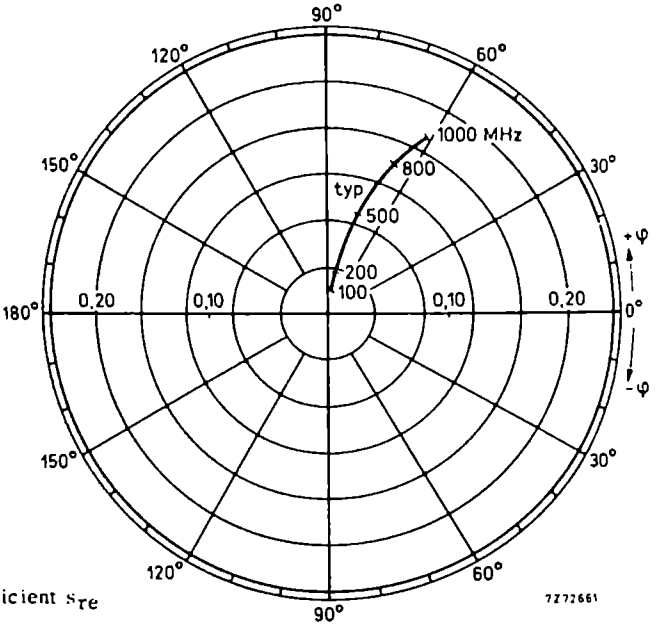


Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50

V_{CE} = 10 V

I_C = 50 mA

T_{amb} = 25 °C

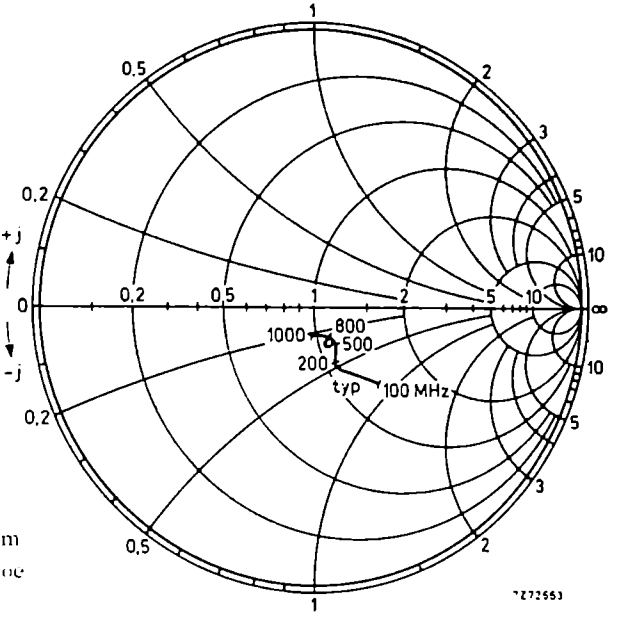


Reverse transmission coefficient s_{re}

V_{CE} = 10 V

I_C = 50 mA

T_{amb} = 25 °C

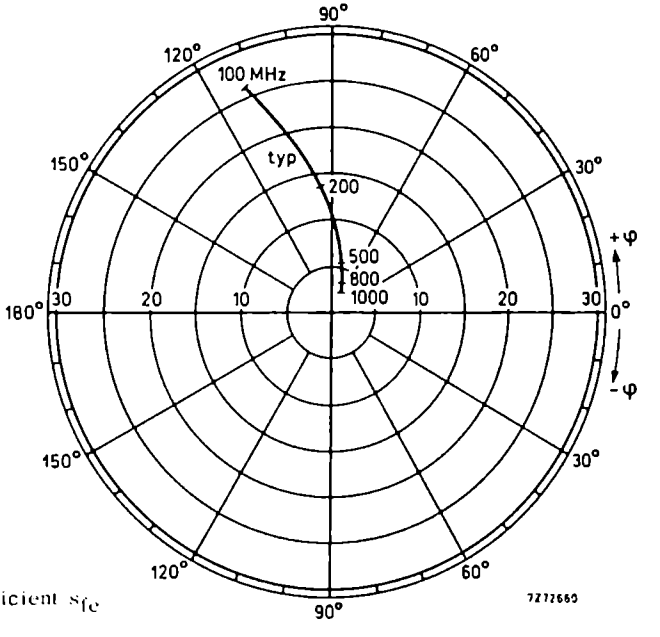


Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50

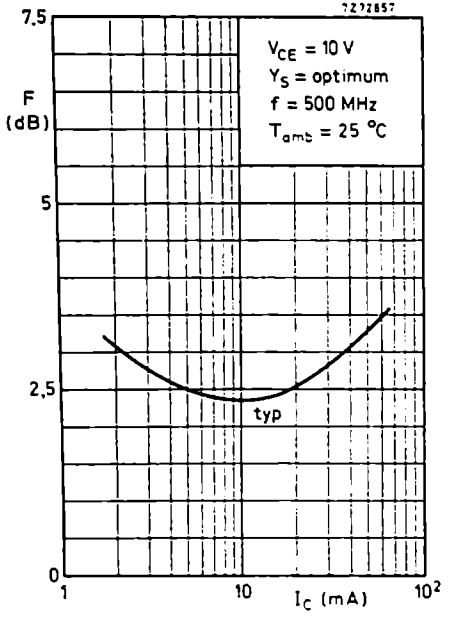
V_{CE} = 10 V

I_C = 50 mA

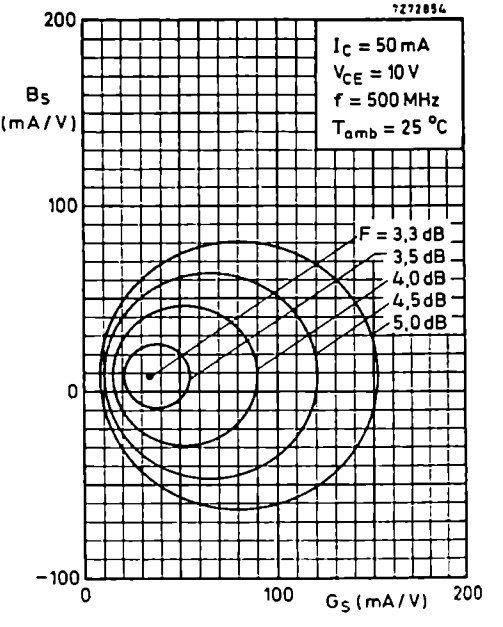
T_{amb} = 25 °C



Forward transmission coefficient s_{fe}



circles of constant noise figure



SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a plastic T-package, primarily intended for MATV applications. The device features excellent output voltage capabilities.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700 mW
Junction temperature	T_j	max.	175 °C
Transition frequency at f = 500 MHz I_C = 70 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	1 pF
Noise figure at optimum source impedance I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	4,0 dB
Maximum unilateral power gain I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5 dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	700 mV

MECHANICAL DATA

SOT-37 (see Fig. 1).

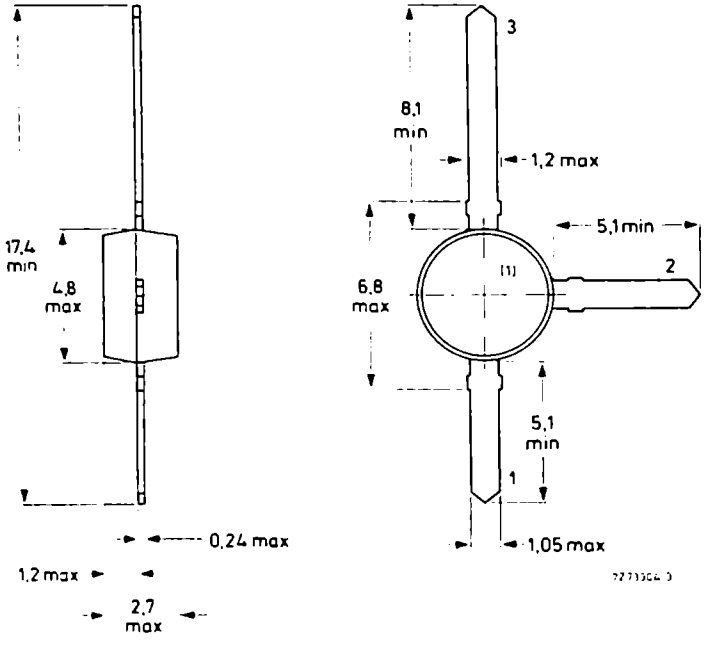
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,0 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to T_{amb} = 70 °C mounted on a fibre-glass print (see Fig. 2) of 50 mm x 50 mm x 1,5 mm	P_{tot}	max.	700 mW
Storage temperature	T_{stg}	−65 to +	175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2) of 50 mm x 50 mm x 1,5 mm	$R_{th\ j\text{-}a}$	=	150 K/W*

* K/W is SI unit for °C/W.

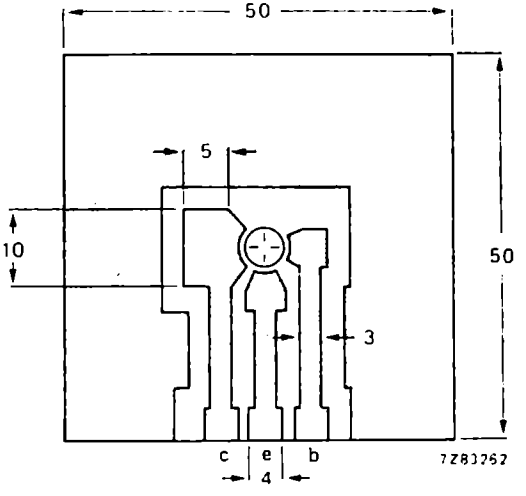


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)
Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	<	100 nA
D.C. current gain* I_C = 70 mA; V_{CE} = 10 V	h_{FE}	>	25
Transition frequency at f = 500 MHz I_C = 70 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	1,5 pF
Emitter capacitance at f = 1 MHz $I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	6,5 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1 pF
Noise figure at optimum source impedance I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	4,0 dB
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = 10 log $\frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5 dB

* Measured under pulse conditions.

s-parameters (common emitter) at V_{CE} = 5 V

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
5	40	0,75/ −41,5°	0,026/+ 69,1°	15,1/+ 155,2°	0,93/ −17,4°
	200	0,62/−128,1°	0,064/+ 41,9°	7,1/+ 106,9°	0,53/ −43,3°
	500	0,55/−174,6°	0,087/+ 47,0°	3,2/ + 79,8°	0,40/ −53,2°
	800	0,56/+ 158,7°	0,115/+ 56,5°	2,1/ + 65,0°	0,39/ −63,2°
	1000	0,58/+ 146,7°	0,135/+ 59,2°	1,7/ + 56,6°	0,39/ −72,5°
	1200	0,61/+ 135,5°	0,159/+ 61,7°	1,4/ + 48,9°	0,39/ −83,0°
10	40	0,60/ −59,1°	0,022/+ 64,1°	24,3/+ 147,2°	0,86/ −26,6°
	200	0,54/−146,1°	0,050/+ 49,4°	9,1/+ 100,7°	0,38/ −54,7°
	500	0,50/+ 175,8°	0,087/+ 59,3°	3,9/ + 78,6°	0,27/ −62,8°
	800	0,52/+ 152,4°	0,129/+ 63,7°	2,5/ + 65,8°	0,27/ −72,2°
	1000	0,53/+ 141,0°	0,157/+ 63,9°	2,1/ + 58,0°	0,27/ −80,7°
	1200	0,56/+ 130,7°	0,186/+ 63,3°	1,7/ + 51,2°	0,27/ −90,9°
30	40	0,39 −105,6°	0,015/+ 60,7°	39,6/+ 133,3°	0,69/ −44,1°
	200	0,44/−168,4°	0,041/+ 65,9°	11,1/ + 94,3°	0,23/ −78,2°
	500	0,46/+ 165,1°	0,094/+ 70,3°	4,7/ + 77,3°	0,16/ −88,4°
	800	0,48/+ 145,4°	0,146/+ 69,2°	3,0/ + 66,5°	0,16/ −98,3°
	1000	0,51/+ 135,6°	0,175/+ 66,6°	2,5/ + 60,1°	0,16/−109,3°
	1200	0,53/+ 126,2°	0,206/+ 64,2°	2,1/ + 54,0°	0,17/−119,7°
50	40	0,37 −129,3°	0,013/+ 63,4°	44,6/+ 127,8°	0,62/ −51,4°
	200	0,43 −174,7°	0,040/+ 71,5°	11,5/ + 92,5°	0,19/ −89,2°
	500	0,45/+ 162,4°	0,095/+ 72,7°	4,8/ + 76,8°	0,14/−101,5°
	800	0,48/+ 143,4°	0,151/+ 70,1°	3,1/ + 66,5°	0,14/−111,5°
	1000	0,50/+ 134,3°	0,182/+ 67,4°	2,5/ + 60,4°	0,14/−121,5°
	1200	0,52/+ 124,9°	0,215/+ 64,8°	2,1/ + 54,6°	0,15/−130,7°
70	40	0,38/−141,7°	0,011/+ 65,1°	46,9/+ 124,9°	0,57/ −55,8°
	200	0,43/−177,6°	0,040/+ 73,7°	11,6/ + 91,6°	0,18/ −96,3°
	500	0,46/+ 161,2°	0,095/+ 73,9°	4,9/ + 76,5°	0,13/−109,5°
	800	0,49/+ 143,1°	0,150/+ 70,6°	3,1/ + 66,4°	0,13/−120,7°
	1000	0,49/+ 133,5°	0,186/+ 67,7°	2,5/ + 60,2°	0,14/−126,2°
	1200	0,52/+ 124,1°	0,218/+ 65,0°	2,1/ + 54,6°	0,15/−135,3°

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
5	40	0,77/ −38,9°	0,023/+ 69,1°	15,2/+ 156,2°	0,93/ −15,4°
	200	0,62/−124,0°	0,059/+ 43,1°	7,4/+ 108,3°	0,57/ −38,0°
	500	0,54/−172,5°	0,081/+ 48,0°	3,4/ + 80,8°	0,45/ −46,8°
	800	0,55/+ 159,9°	0,106/+ 57,8°	2,2/ + 65,9°	0,43/ −57,1°
	1000	0,56/+ 147,2°	0,126/+ 61,5°	1,8/ + 57,5°	0,43/ −64,9°
	1200	0,58/+ 135,9°	0,150/+ 64,4°	1,5/ + 50,1°	0,42/ −74,7°
10	40	0,62/ −54,5°	0,020/+ 64,9°	24,5/+ 148,7°	0,87/ −23,5°
	200	0,53/−142,3°	0,046/+ 49,6°	9,6/+ 102,0°	0,42/ −47,8°
	500	0,48/+ 177,6°	0,080/+ 59,4°	4,2/ + 79,4°	0,31/ −54,2°
	800	0,50/+ 153,2°	0,118/+ 64,0°	2,7/ + 66,4°	0,31/ −63,5°
	1000	0,52/+ 142,3°	0,143/+ 64,1°	2,2/ + 59,1°	0,31/ −70,0°
	1200	0,54/+ 131,8°	0,168/+ 64,3°	1,8/ + 52,4°	0,30/ −79,5°
30	40	0,41/ −94,4°	0,014/+ 62,2°	40,9/+ 135,0°	0,72/ −39,2°
	200	0,42/−164,6°	0,039/+ 65,5°	11,8/ + 95,1°	0,25/ −64,5°
	500	0,42/+ 167,0°	0,087/+ 70,4°	4,9/ + 77,9°	0,19/ −71,1°
	800	0,45/+ 146,6°	0,136/+ 69,3°	3,2/ + 67,1°	0,18/ −79,1°
	1000	0,47/+ 136,6°	0,166/+ 67,2°	2,6/ + 60,6°	0,18/ −83,8°
	1200	0,49/+ 126,3°	0,196/+ 65,0°	2,2/ + 54,6°	0,17/ −95,1°
50	40	0,36/−114,4°	0,012/+ 62,7°	46,5/+ 129,6°	0,63/ −45,7°
	200	0,40/−171,0°	0,038/+ 70,4°	12,3/ + 93,1°	0,20/ −71,4°
	500	0,41/+ 163,9°	0,090/+ 72,4°	5,1/ + 77,1°	0,16/ −79,7°
	800	0,44/+ 144,7°	0,140/+ 70,1°	3,3/ + 66,7°	0,15/ −86,0°
	1000	0,47/+ 135,3°	0,168/+ 67,3°	2,7/ + 60,8°	0,14/ −95,3°
	1200	0,49/+ 125,2°	0,197/+ 65,0°	2,3/ + 55,2°	0,14/−106,6°
70	40	0,35/−125,4°	0,012/+ 63,6°	49,1/+ 125,7°	0,58/ −49,5°
	200	0,40/−173,7°	0,038/+ 72,7°	12,4/ + 92,0°	0,18/ −74,8°
	500	0,41/+ 162,6°	0,091/+ 73,2°	5,2/ + 76,7°	0,15/ −82,0°
	800	0,44/+ 144,1°	0,143/+ 70,2°	3,3/ + 66,4°	0,14/ −87,4°
	1000	0,46/+ 134,6°	0,175/+ 67,3°	2,7/ + 60,2°	0,13/ −95,3°
	1200	0,48/+ 124,1°	0,200/+ 64,8°	2,3/ + 54,6°	0,13/−109,5°

Output voltage at d_{im} = −60 dB (see Figs 3 and 5)
(DIN45004B, par. 6.3: 3-tone)
I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C
$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz
$V_q = V_o$ −6 dB; f_q = 803,25 MHz
$V_r = V_o$ −6 dB; f_r = 805,25 MHz
Measured at $f_{(p+q-r)}$ = 793,25 MHz — V_o typ. 700 mV

Second harmonic distortion (see Figs 3 and 6)
I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C
$V_p = V_o$ = 316 mV = 50 dBmV; f_p = 250 MHz
$V_q = V_o$ = 316 mV = 50 dBmV; f_q = 560 MHz
measured at $f_{(p+q)}$ = 810 MHz — d_2 typ. −52 dB

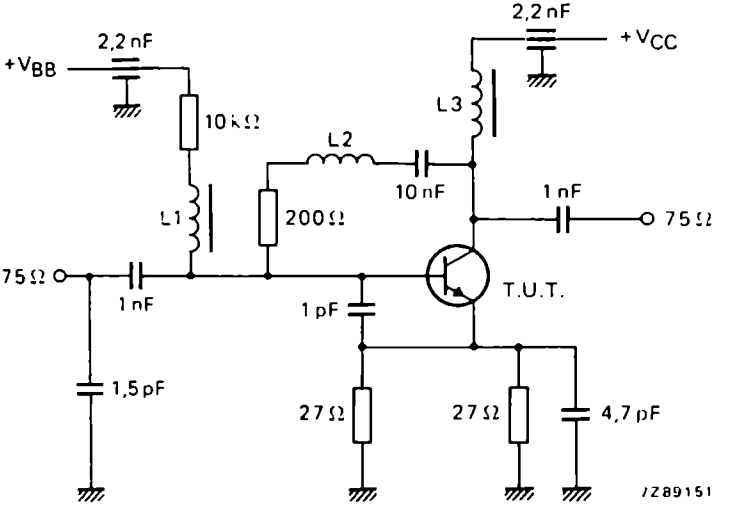


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH micro choke
L2 = 1½ turns Cu wire (0,4 mm); internal diameter 3,0 mm; winding pitch 1 mm

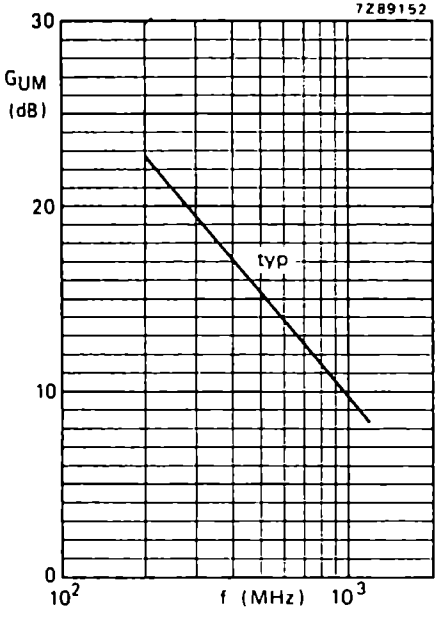


Fig. 4 V_{CE} = 10 V; I_C = 70 mA; T_{amb} = 25 °C.

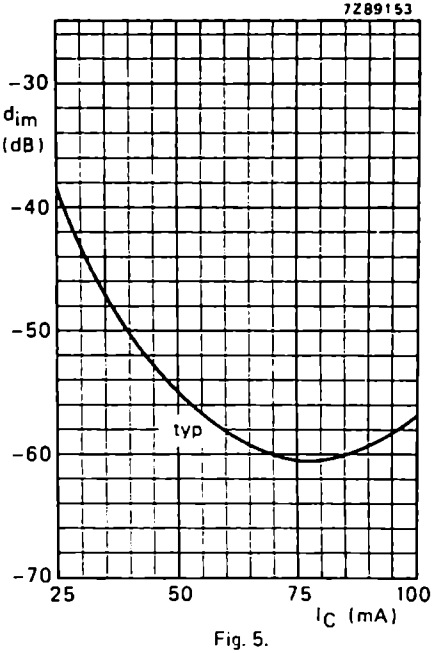


Fig. 5.

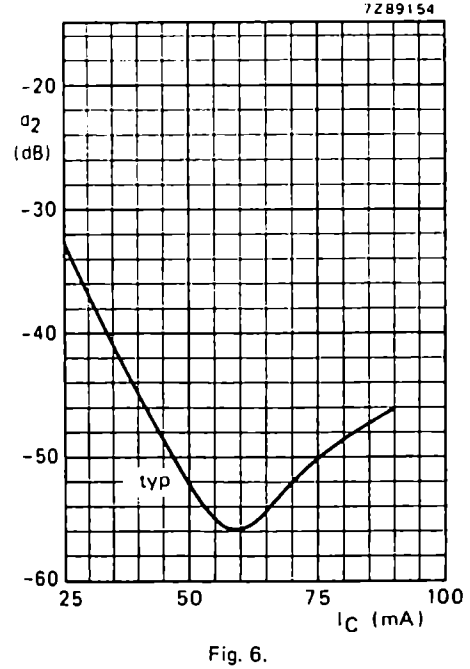


Fig. 6.

Intermodulation distortion (Fig. 5) and second harmonic distortion (Fig. 6) are measured in MATV circuit (see Fig. 3).

Fig. 5 V_{CE} = 10 V; V_o = 700 mV = 56,9 dBmV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C.

Fig. 6 V_{CE} = 10 V; V_o = 316 mV = 50 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C.

Conditions for Figs 7 and 8:

V_{CE} = 10 V; I_C = 70 mA;
T_{amb} = 25 °C.

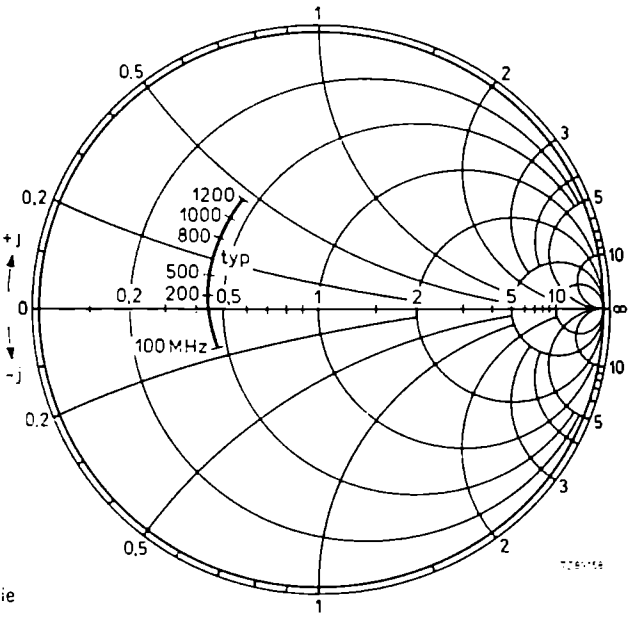


Fig. 7 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

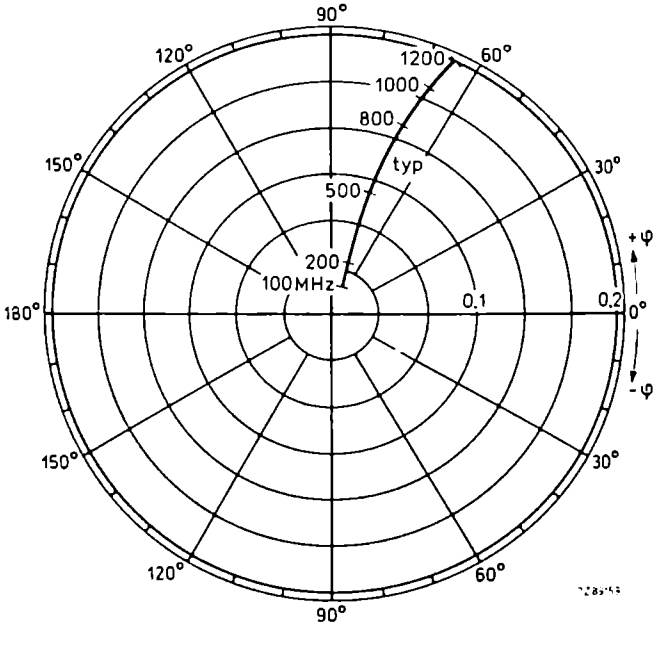


Fig. 8 Reverse transmission coefficient s_{re}.

Conditions for Figs 9 and 10:

V_{CE} = 10 V; I_C = 70 mA;
T_{amb} = 25 °C.

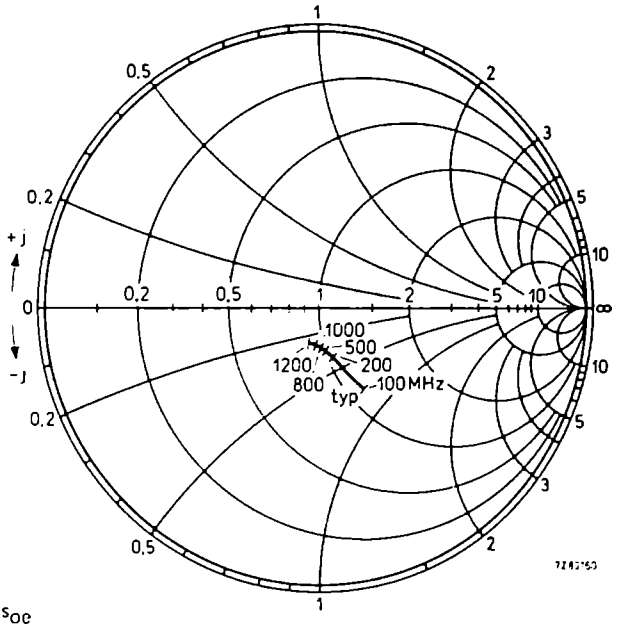


Fig. 9 Output impedance derived from output reflection coefficient s_{oe} co ordinates in ohm x 50.

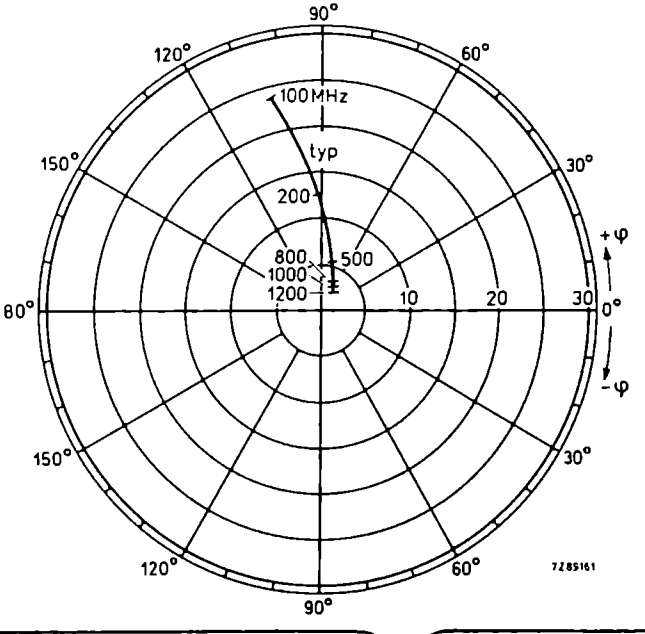


Fig. 10 Forward transmission coefficient s_{fe}.

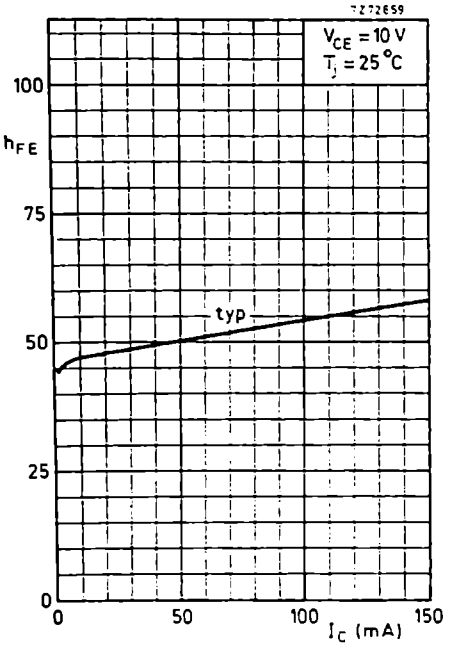


Fig. 11.

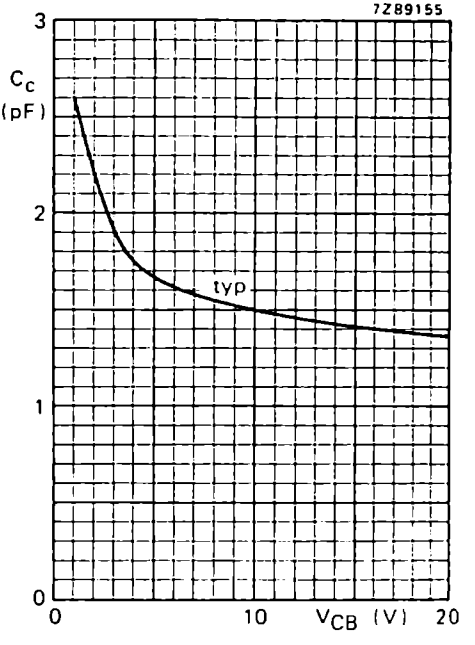


Fig. 12 $I_E = I_e = 0$; f = 1 MHz, T_j = 25 °C.

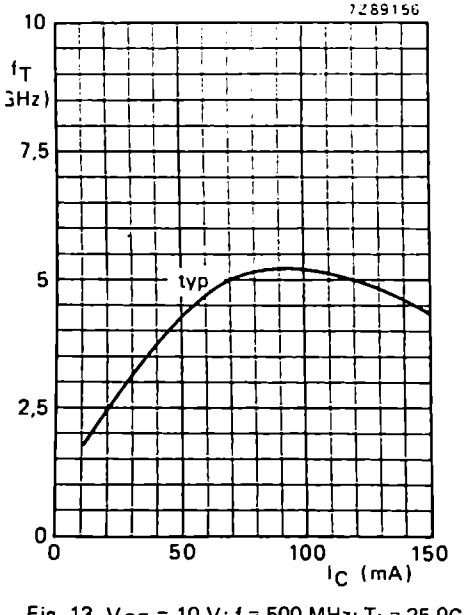


Fig. 13 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C.

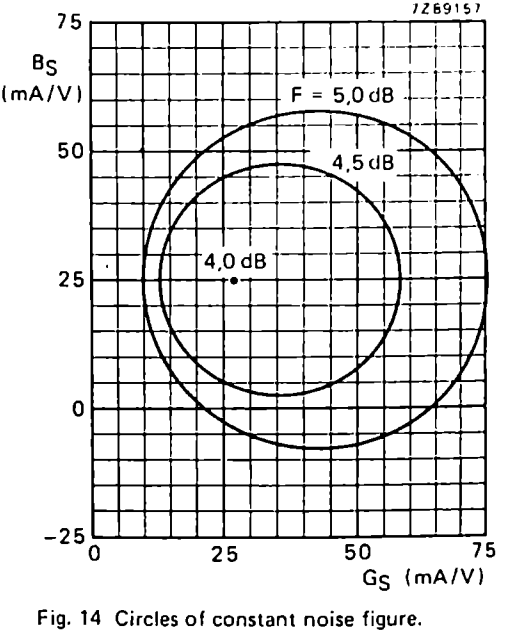


Fig. 14 Circles of constant noise figure. V_{CE} = 10 V; I_C = 70 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.
It is primarily intended for use in u.h.f. low power amplifiers such as in pocket phones, paging systems, etc.
The transistor features low current consumption (100 μA - 1 mA); thanks to its high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	8	V
Collector-emitter voltage (open base)	V_{CEO}	max.	5	V
Collector current (d.c.)	I_C	max.	2.5	mA
Total power dissipation up to T_{amb} = 135 °C	P_{tot}	max.	30	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 1 mA; V_{CE} = 1 V	f_T	typ.	2.3	GHz
Feedback capacitance at f = 1 MHz I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C	C_{re}	≤	0.4	pF
Noise figure at optimum source impedance I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3.8	dB
Max. unilateral power gain (see page 3) I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17	dB

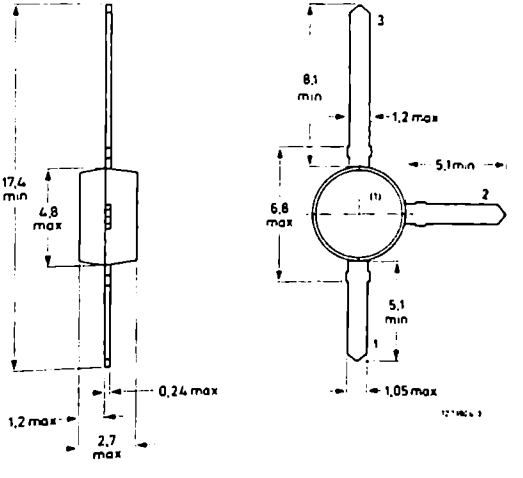
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

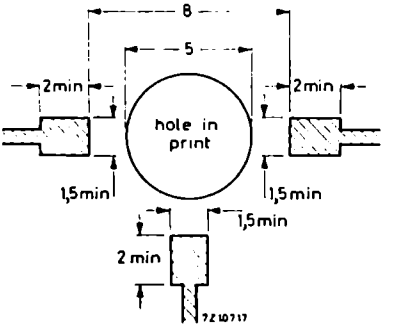
Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	8	V
Collector-emitter voltage (open base)	V_{CEO}	max.	5	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Current				
Collector current (d.c.)	I_C	max.	2.5	mA
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	5.0	mA
Power dissipation				
Total power dissipation up to T_{amb} = 135 °C	P_{tot}	max.	30	mW
Temperatures				
Storage temperature	T_{stg}	−65 to	+150	°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a glass-fibre print *) of 40 mm × 25 mm × 1 mm	$R_{th\ j\text{-}a}$	0.5	°C/mW

*) Requirements for glass-fibre print

(dimensions in mm)

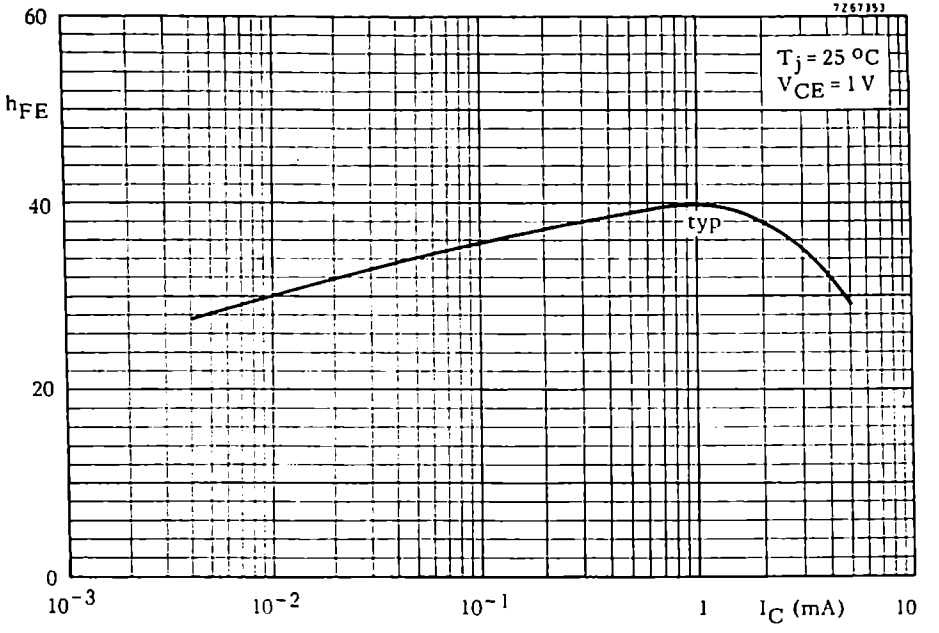


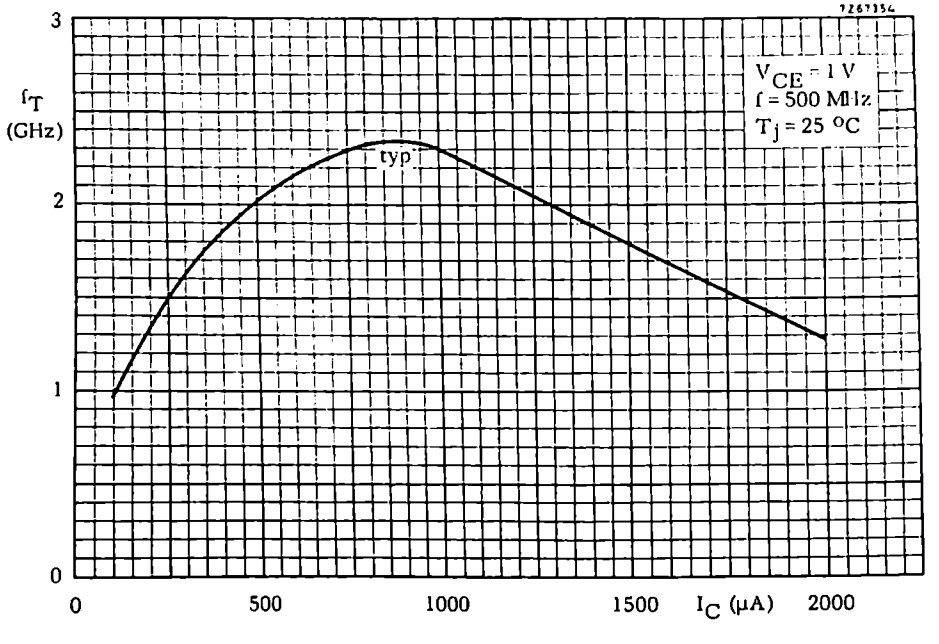
CHARACTERISTICS

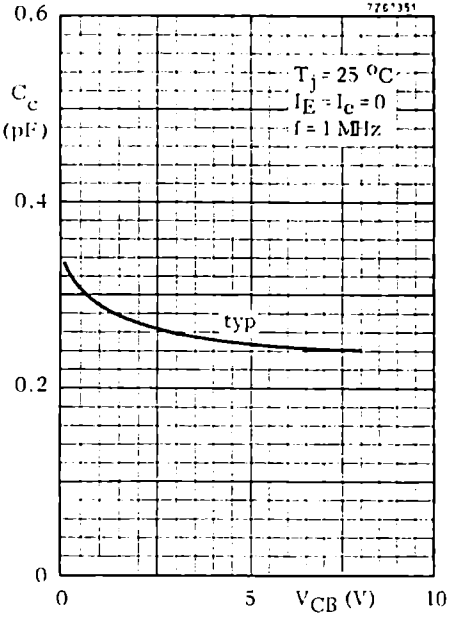
T_j = 25 °C unless otherwise specified

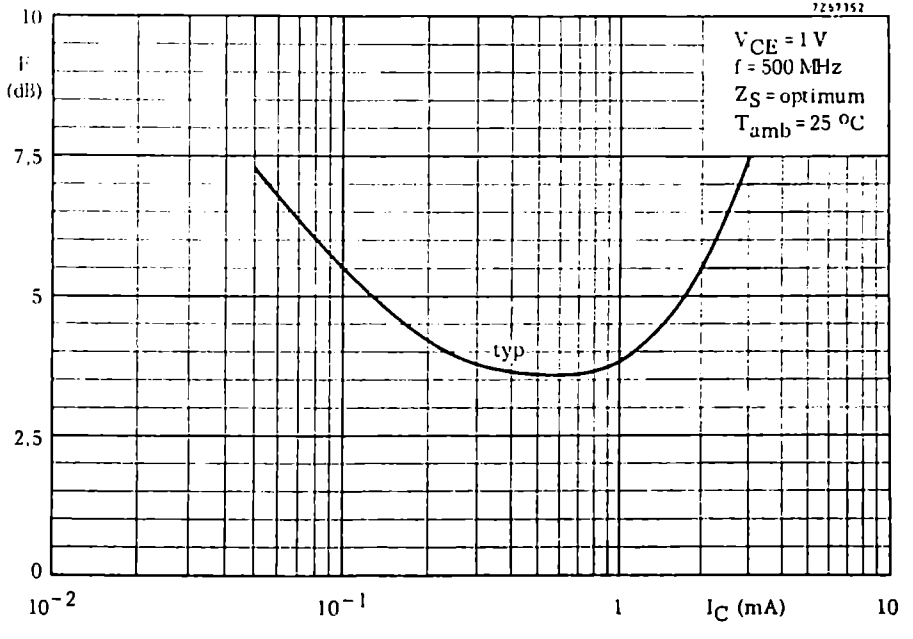
Collector cut-off current				
I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50	nA
D.C. current gain 1)				
I_C = 10 µA ; V_{CE} = 1 V	h_{FE}	>	20	
		typ.	30	
I_C = 1 mA; V_{CE} = 1 V	h_{FE}	>	20	
		typ.	40	
Saturation voltages				
I_C = 10 µA ; I_B = 1 µA	V_{CEsat}	<	200	mV
	V_{BEsat}	<	750	mV
I_C = 1 mA; I_B = 0.1 mA	V_{CEsat}	<	175	mV
	V_{BEsat}	<	900	mV
Transition frequency at f = 500 MHz 1)				
I_C = 1 mA; V_{CE} = 1 V	f_T	>	1.2	GHz
		typ.	2.3	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 0.5 V	C_c		0.55	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c$ = 0; V_{EB} = 0	C_e	<	0.45	pF
Feedback capacitance at f = 1 MHz				
I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C	C_{re}	<	0.4	pF
Noise figure at optimum source impedance				
I_C = 0.1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	5.5	dB
I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3.8	dB
Max. unilateral power gain (s_{re} assumed to be zero)				
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$				
I_C = 1 mA; V_{CE} = 1 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	typ.	24	dB
I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17	dB
I_C = 1 mA; V_{CE} = 1 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11	dB

1) Measured under pulse conditions.


7Z67353
60
40
20
0
h_{FE}
T_j = 25 °C
V_{CE} = 1 V
typ
10^{-3}
10^{-2}
10^{-1}
1
10
I_C (mA)


7Z67354
3
2
1
0
f_T
(GHz)
V_{CE} = 1 V
f = 500 MHz
T_j = 25 °C
typ
0
500
1000
1500
2000
I_C (μA)

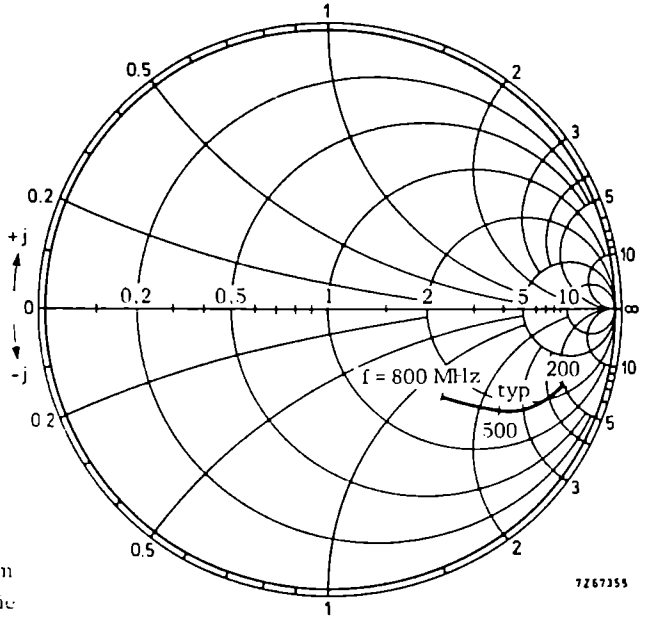

7761351
0.6
C_c (pF)
0.4
0.2
0
T_j = 25 °C
$I_E = I_c = 0$
f = 1 MHz
typ
0
5
V_{CB} (V)
10


7253352
10
F (dB)
7,5
5
2,5
0
V_{CE} = 1 V
f = 500 MHz
Z_S = optimum
T_{amb} = 25 °C
typ
10^{-2}
10^{-1}
1
I_C (mA)
10

V_{CE} = 1 V

I_C = 1 mA

T_{amb} = 25 °C

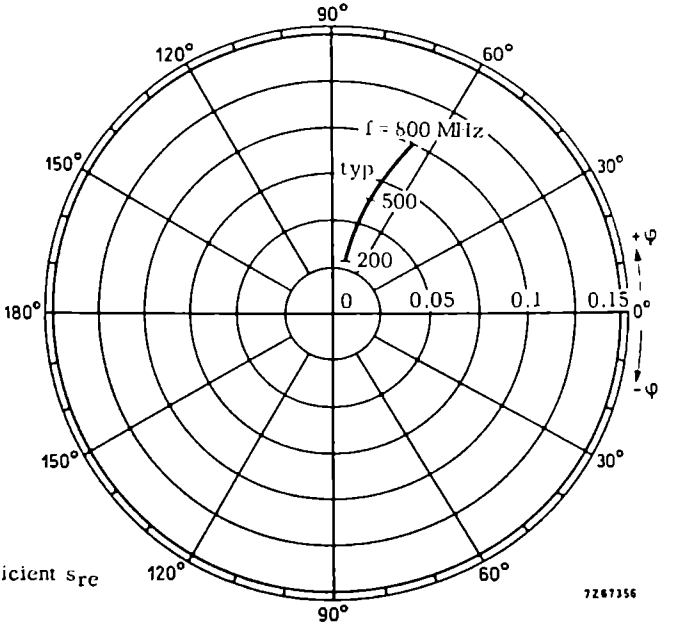


Input impedance derived from input reflection coefficient s_{ie} coordinates in ohm x 50

V_{CE} = 1 V

I_C = 1 mA

T_{amb} = 25 °C

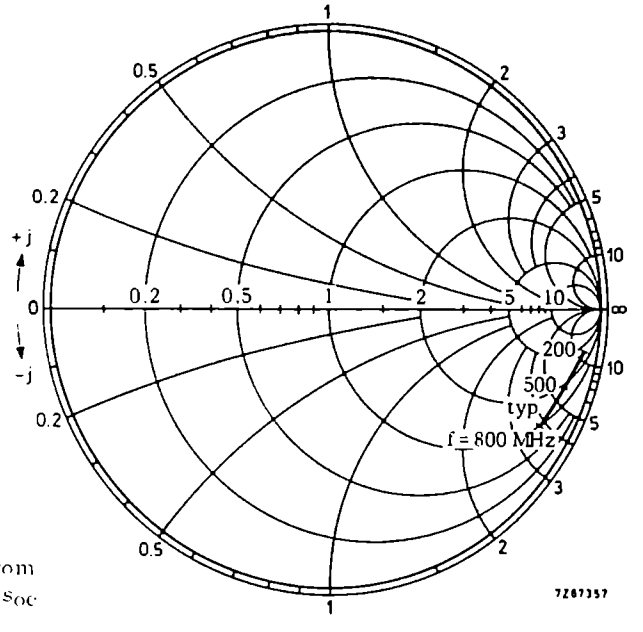


Reverse transmission coefficient s_{re}

V_{CE} = 1 V

I_C = 1 mA

T_{amb} = 25 °C

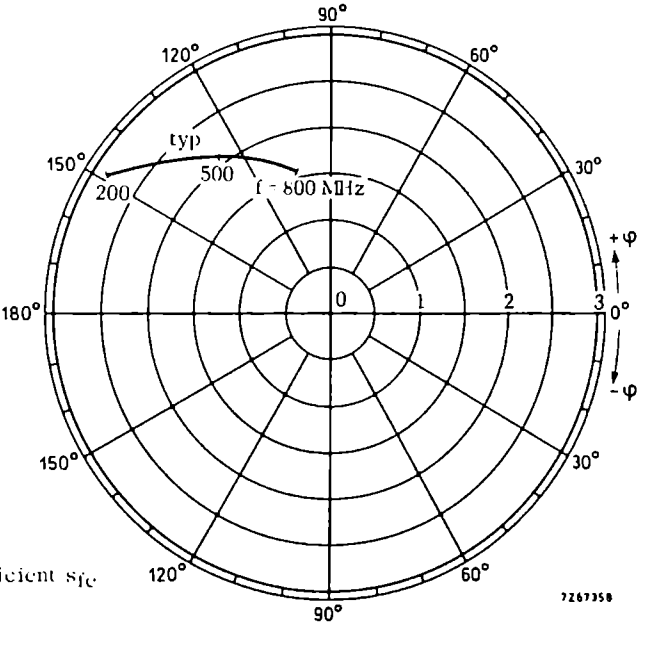


Output impedance derived from output reflection coefficient s_{oe} coordinates in ohm x 50

V_{CE} = 1 V

I_C = 1 mA

T_{amb} = 25 °C



Forward transmission coefficient s_{fe}

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter transistor in a TO-39 metal envelope, with the collector connected to the case. The transistor has extremely good intermodulation properties and a high power gain. It is a ruggedized version of the BFW16, which it succeeds. It is primarily intended for:

- Final and driver stages of channel and band aerial amplifiers with high output power for bands I, II, III and IV/V (40–860 MHz).
- Final stage of the wideband vertical amplifier in high speed oscilloscopes.

QUICK REFERENCE DATA

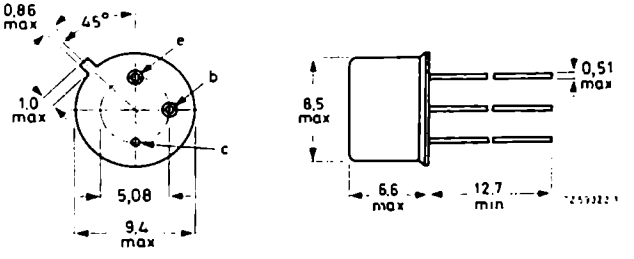
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.		40	V
Collector-emitter voltage (open base)	V_{CEO}	max.		25	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.		300	mA
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.		1,5	W
Junction temperature	T_j	max.		200	°C
Feedback capacitance at f = 1 MHz I_C = 10 mA; V_{CE} = 15 V	C_{re}	typ.		1,7	pF
Transition frequency I_C = 150 mA; V_{CE} = 15 V; f = 500 MHz	f_T	typ.		1,2	GHz
			f = 200	800	MHz
Power gain (not neutralized) I_C = 70 mA; V_{CE} = 18 V	G_p	typ.	16	6,5	dB
Output power d_{im} = −30 dB; VSWR at output < 2; I_C = 70 mA; V_{CE} = 18 V	P_o	typ.	150	90	mW

MECHANICAL DATA

Dimensions in mm

Collector connected to case

Fig. 1 TO-39.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage ($R_{BE} \leq 50\ \Omega$) peak value	V_{CERM}	max.	40	V 1)
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V 1)
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Currents				
Collector current (d.c.)	I_C	max.	150	mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300	mA
Power dissipation				
Total power dissipation up to $T_{mb} = 125\ ^oC$	P_{tot}	max.	1.5	W
Temperatures				
Storage temperature	T_{stg}		−65 to +200	^oC
Junction temperature	T_j	max.	200	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	250	$^oC/W$
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50	$^oC/W$
From mounting base to heatsink mounted with top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb\text{-}h}$		1.2	$^oC/W$

1) $I_C = 10$ mA.

CHARACTERISTICS

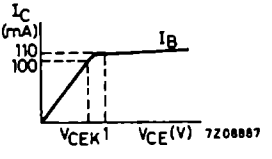
T_j 25 °C unless otherwise specified

Collector cut-off current

$I_E = 0$; V_{CB} 20 V; T_j 150 °C	I_{CBO}	<	20	μA

Knee voltage

I_C = 100 mA; I_B value for which I_C = 110 mA at V_{CE} = 1 V	V_{CEK}	<	0.75	V



D.C. current gain

I_C = 50 mA; V_{CE} = 5 V	h_{FE}		25	
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	>	25	

Transition frequency

I_C 150 mA; V_{CE} = 15 V; f = 500 MHz	f_T	typ.	1.2	GHz

Collector capacitance at f = 1 MHz

$I_E = I_e = 0$; V_{CB} = 15 V	C_c	<	4	pF

Feedback capacitance at f = 1 MHz

I_C 10 mA; V_{CE} = 15 V; T_{amb} = 25 °C	$-C_{re}$	typ.	1.7	pF

Noise figure at f = 200 MHz

I_C 30 mA; V_{CE} 15 V; R_S = 75 Ω; T_{amb} =25 °C	F	<	6	dB

Power gain (not neutralized)

		f = 200	800	MHz
I_C = 70 mA; V_{CE} = 18 V; T_{amb} = 25 °C	G_p	typ. 16	6.5	dB

CHARACTERISTICS (continued)

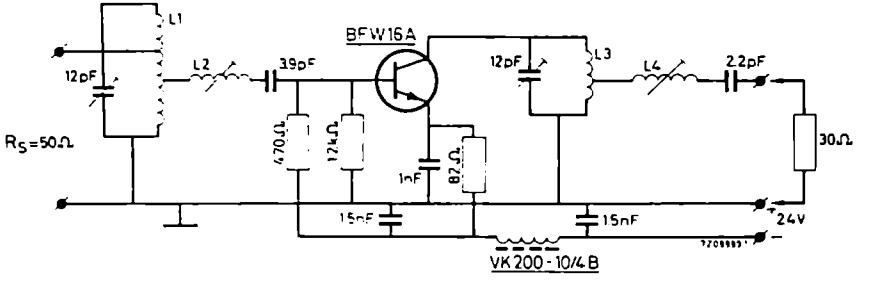
Intermodulation characteristics

1. Output power at f = 200 MHz; T_{amb} = 25 °C

I_C = 70 mA; V_{CE} = 18 V; V.S.W.R. at output = 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (Channel 9)

P_o		130	mW
	typ.	150	mW

Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 11 mm.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
This is so if $-C_L = +C_{oe}$,
in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 220\ \Omega$; $C_L = -5.6$ pF.

C_{oe} is found by 4 pF of the transistor and 1.6 pF by the mounting system concerning of a borium nitride washer between the envelope of the transistor and the chassis.
See also page 10, note 1.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 220 Ω resistor in parallel with a 5.6 pF capacitor between the collector and emitter connections of the output circuit.

2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1).
After this adjustment, no further change may be made in the output circuit.

3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
Corrections can be made by tuning L2; this will not disturb the band pass curve.

CHARACTERISTICS (continued)

Intermodulation characteristics

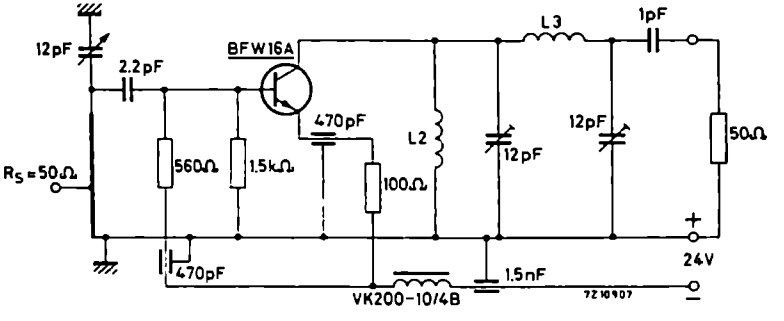
2. Output power at f = 800 MHz; T_{amb} = 25 °C

I_C = 70 mA; V_{CE} = 18 V; V.S.W.R. at output ≤ 2

f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB

measured at $f_{(2q-p)}$ = 806 MHz (Channel 62) P_o 70 mW typ. 90 mW

Test circuit:



Coil data:

L1 = 25 mm × 7 mm × 0.85 mm silver plated Cu strip
Tap of the input at 5 mm from earth.

L2 = 13 turns enamelled Cu wire (0.6 mm); int. diam. 8 mm

L3 = 1.5 turns Cu wire (1.3 mm); int. diam. 8 mm

Basis of adjustment

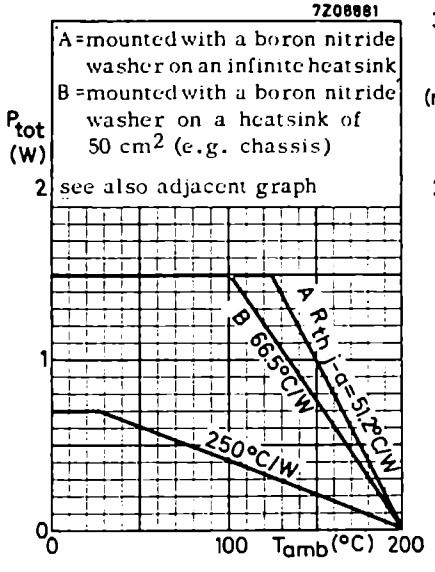
At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs: that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

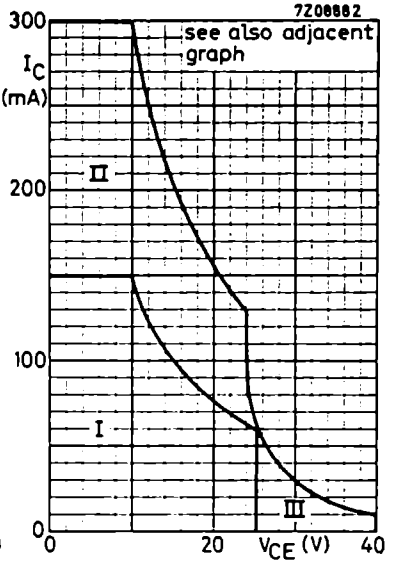
$$P_o = \frac{I_C(V_{CE}-V_{CEK})}{2} = 480 \text{ mW}.$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 480 mW.

With this adjusting method care must be taken, that the transistor is not destructed by second breakdown (the voltage swing may not exceed the rated V_{CER} value). Therefore as soon as clipping occurs, the increase of the input signal should be stopped until the clipping has been eliminated. After this adjustment has been made no further change may be made in the output circuit.

Adjust the input circuit for maximum power gain and good band pass curve. The V.S.W.R. of the output is then ≤ 2 over the whole channel.

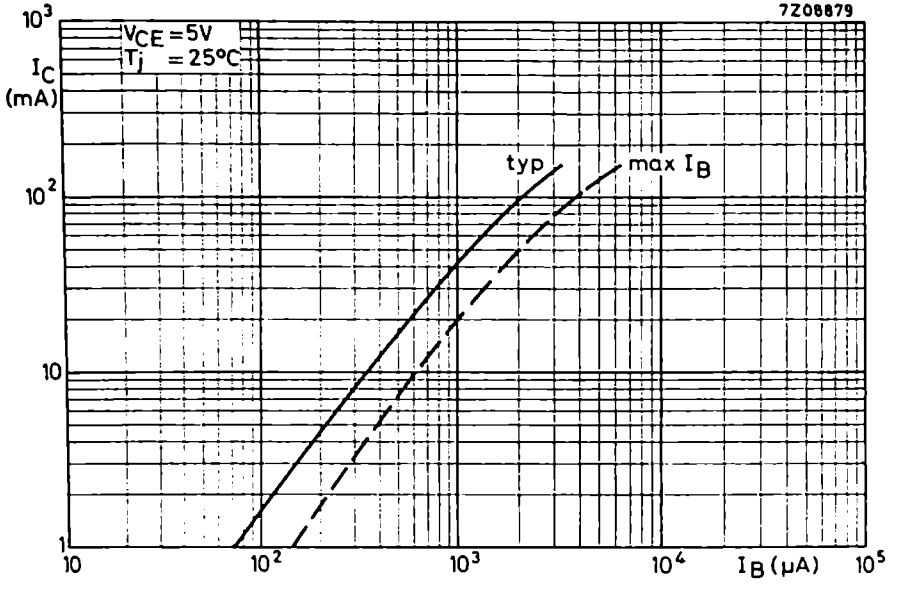


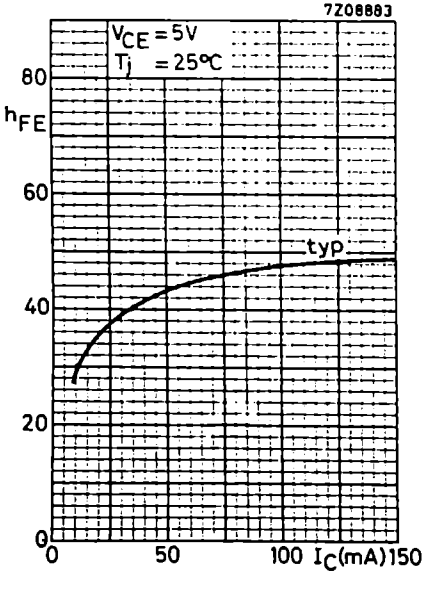


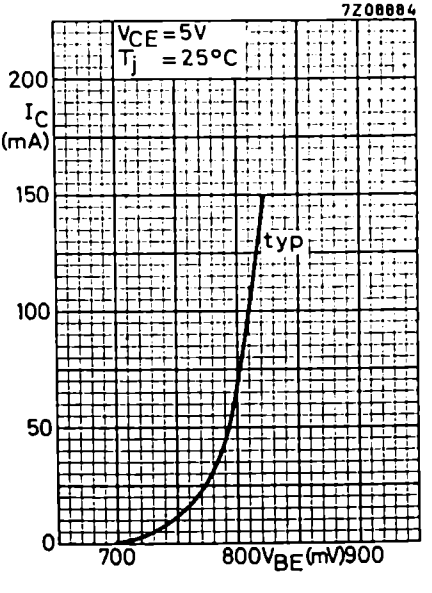
I = Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

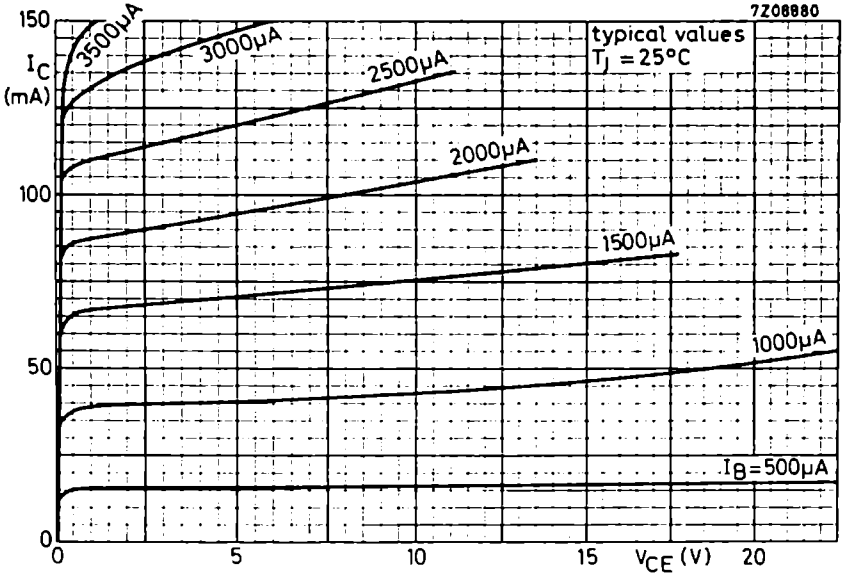
II = Additional region of operation at $f \geq 1$ MHz.

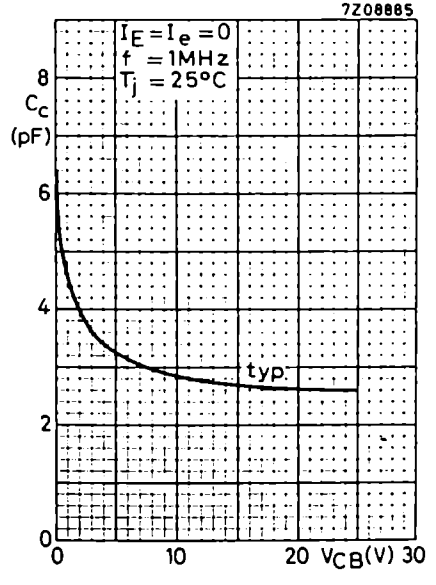
III = Operating under pulsed conditions is allowed, provided the transistor is cut-off with $R_{BE} \leq 50\ \Omega$ and $f \geq 1$ MHz.

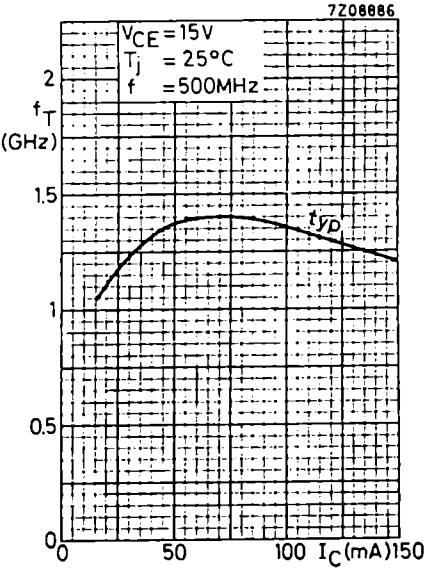

7Z08879
V_{CE} = 5V
T_j = 25°C
I_C (mA)
10^3
10^2
10
1
typ
max I_B
10
10^2
10^3
10^4
I_B (μA)
10^5


7Z08883
V_{CE} = 5V
T_j = 25°C
h_{FE}
80
60
40
20
0
typ
0
50
100
I_C(mA)
150


7Z08884
V_{CE} = 5V
T_j = 25°C
I_C (mA)
200
150
100
50
0
typ
700
800
V_{BE}(mV)
900


7Z08880
typical values
$T_j = 25°C$
I_C (mA)
3500μA
3000μA
2500μA
2000μA
1500μA
1000μA
I_B=500μA
150
100
50
0
0
5
10
15
V_{CE} (V)
20


7Z08885
$I_E = I_e = 0$
f = 1MHz
T_j = 25°C
C_c (pF)
typ.
8
6
4
2
0
0
10
20
V_{CB}(V)
30


7Z08886
V_{CE} = 15V
T_j = 25°C
f = 500MHz
f_T (GHz)
typ.
2
1.5
1
0.5
0
0
50
100
I_C(mA)
150

APPLICATION INFORMATION

Performance of channel- and band amplifiers [1]

Frequency range	channel 4 61-68	channel 9 202-209	channel 55 742-750	band I 47-68	band II 87.5-108	band III 174-230	MHz
Transistor used in							
final stage	BFW16A	BFW16A	BFW16A	BFW16A	BFW16A	BFW16A	
driver stage		BFW16A	BFW16A			BFW16A	
second stage			BFY90				
first stage	BFY90	BFY90	BFY90	BFY90	BFY90	BFY90	
Output power at							
d_{im} = -30 dB	150 [2]	150 [2]	100				mW
d_{im} = -50 dB					30		mW
d_{im} = -60 dB				10		10	mW
Power gain	50	44	26.5	51	43	39	dB
Noise figure	-	6	8	6.0-6.5	6.5	6.5	dB
V.S.W.R. over the whole channel or band							
for the input	2	2	2	< 2	< 2	< 2	
for the output	2	2	< 2	< 2	< 2	< 2	
Load impedance	75	30	50	30	30	30	Ω
Source impedance	60	60	50	60	60	60	Ω

[1] Application information bulletins of all these amplifiers and a study of intermodulation are available on request.

[2] V_o = 2.2 V over R_L = 30 Ω or
V_o = 3 V over R_L = 60 Ω.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter transistor in a TO-39 metal envelope, with the collector connected to the case. The transistor has extremely good intermodulation properties and a high power gain. It is a ruggedized version of the BFW17, which it succeeds. It is primarily intended for final and driver stages of channel and band aerial amplifiers with high output power for bands I, II and III (40–230 MHz).

QUICK REFERENCE DATA

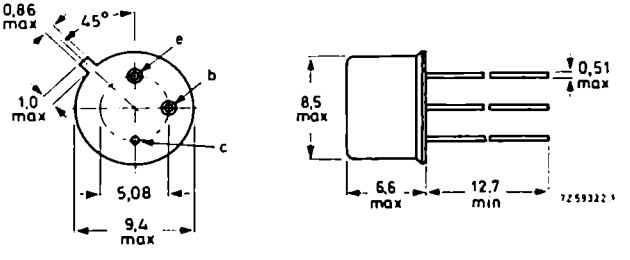
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300 mA
Total power dissipation up to $T_{mb} = 125$ °C	P_{tot}	max.	1,5 W
Junction temperature	T_j	max.	200 °C
Feedback capacitance at $f = 1$ MHz $I_C = 10$ mA; $V_{CE} = 15$ V	C_{re}	typ.	1,7 pF
Transition frequency $I_C = 150$ mA; $V_{CE} = 15$ V; $f = 500$ MHz	f_T	typ.	1,1 GHz
Power gain (not neutralized) $I_C = 70$ mA; $V_{CE} = 18$ V; $f = 200$ MHz	G_p	typ.	16 dB
Output power $d_{im} = -30$ dB; VSWR at output < 2; $I_C = 70$ mA; $V_{CE} = 18$ V	P_o	typ.	150 mW

MECHANICAL DATA

Dimensions in mm

Collector connected to case

Fig. 1 TO-39.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage ($R_{BE} \leq 50\ \Omega$) peak value	V_{CERM}	max.	40	V [1]
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V [1]
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Currents				
Collector current (d.c.)	I_C	max.	150	mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300	mA
Power dissipation				
Total power dissipation up to $T_{mb} = 125\ ^oC$	P_{tot}	max.	1.5	W
Temperatures				
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C
THERMAL RESISTANCE				
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	250	°C/W
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50	°C/W
From mounting base to heatsink mounted with top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb\text{-}h}$	=	1.2	°C/W

[1]) I_C = 10 mA.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

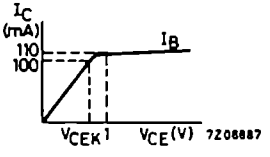
Collector cut-off current

I_E = 0; V_{CB} = 20 V; T_j = 150 °C	I_{CBO}	<	20	μA

Knee voltage

I_C = 100 mA; I_B = value for which
I_C = 110 mA at V_{CE} = 1 V

	V_{CEK}	<	0.75	V



D.C. current gain

I_C = 50 mA; V_{CE} = 5 V	h_{FE}	>	25	
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	>	25	

Transition frequency

I_C = 150 mA; V_{CE} = 15 V; f = 500 MHz	f_T	typ.	1.1	GHz

Collector capacitance at f = 1 MHz

I_E = I_c = 0; V_{CB} = 15 V	C_c	<	4	pF

Feedback capacitance at f = 1 MHz

I_C = 10 mA; V_{CE} = 15 V; T_{amb} = 25 °C	$-C_{re}$	typ.	1.7	pF

Power gain (not neutralized)

I_C = 70 mA; V_{CE} = 18 V f = 200 MHz; T_{amb} = 25 °C	G_p	typ.	16	dB

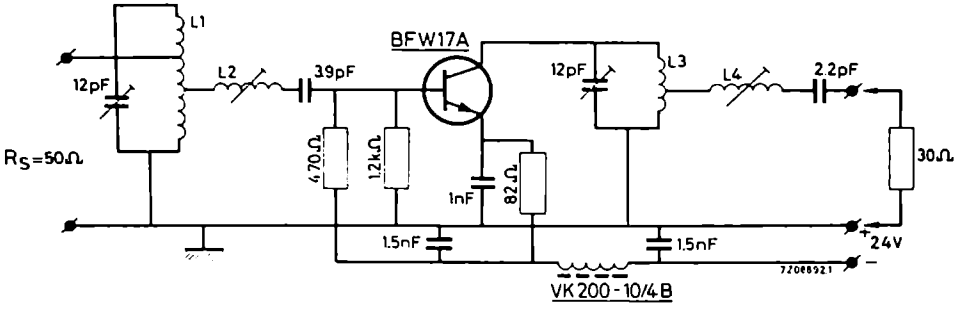
CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at f = 200 MHz; T_{amb} = 25 °C

I_C = 70 mA; V_{CE} = 18 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (Channel 9) P_o typ. 150 mW

Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 11 mm.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
   This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C}$$

   in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short circuited input.

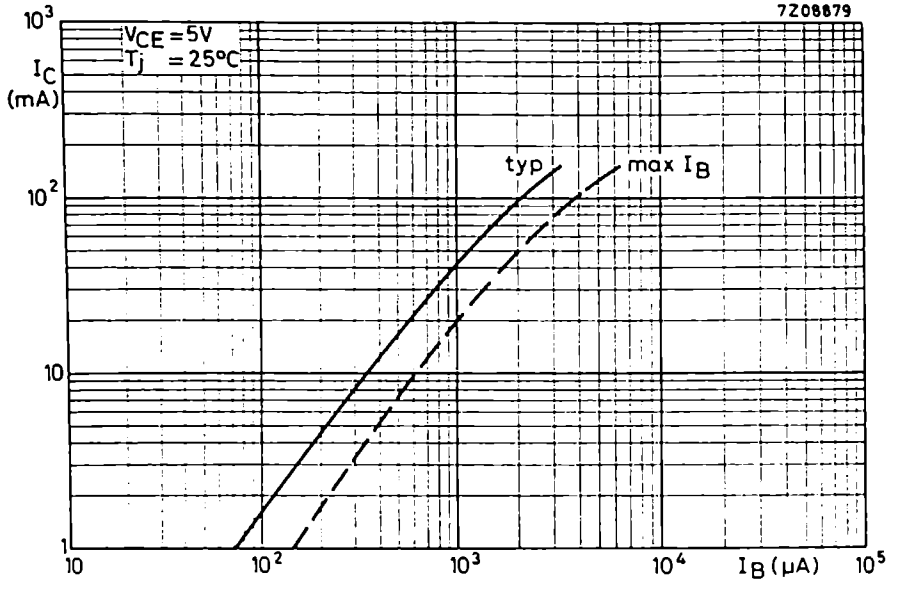
For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 220\ \Omega$; $C_L = -5.6$ pF.
C_{oe} is found by 4 pF of the transistor and 1.6 pF by the mounting system concerning of a borium nitride washer between the envelope of the transistor and the chassis.

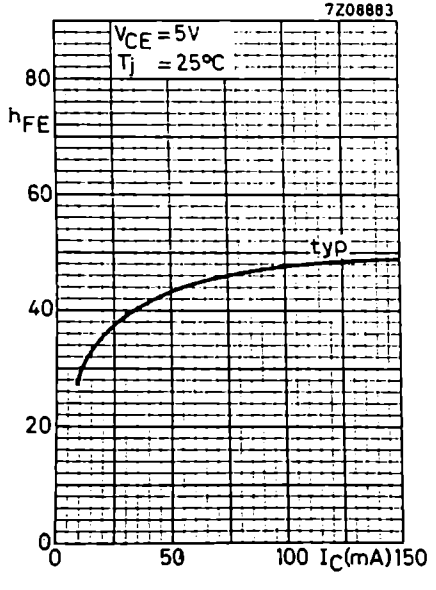
Adjustment procedure

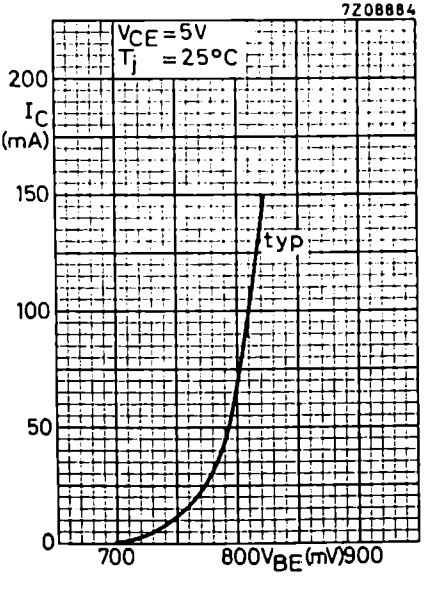
1. Remove the transistor and connect a dummy consisting of a 220 Ω resistor in parallel with a 5.6 pF capacitor between the collector and emitter connections of the output circuit.

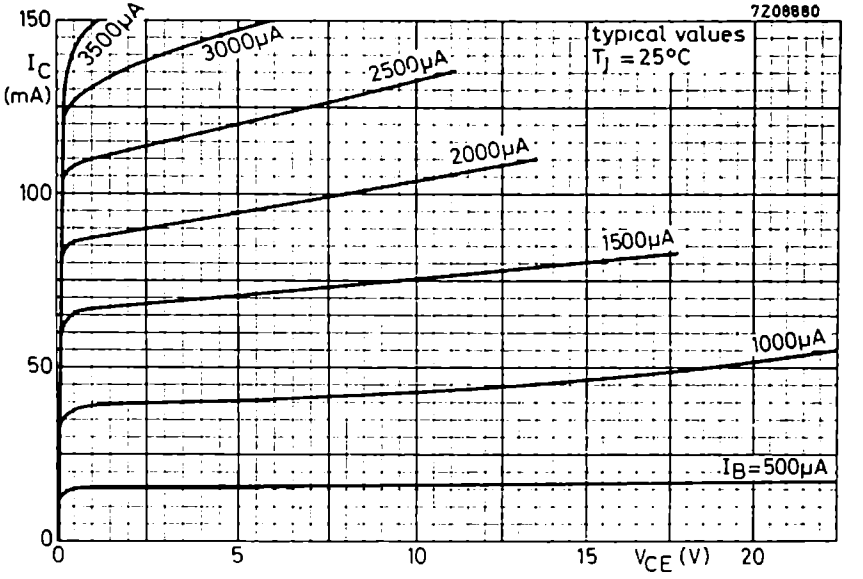
2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1). After this adjustment, no further change may be made in the output circuit.

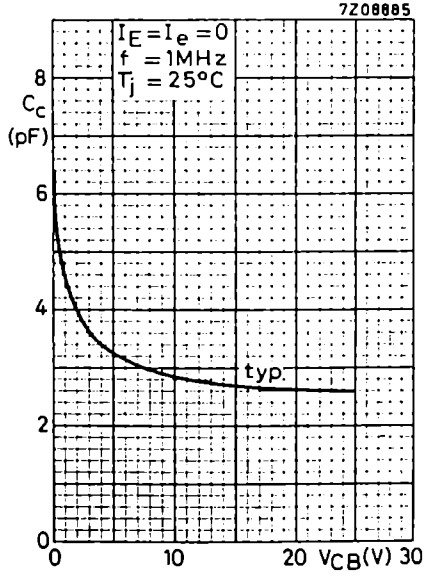
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
   The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
   Corrections can be made by tuning L2; this will not disturb the band pass curve.

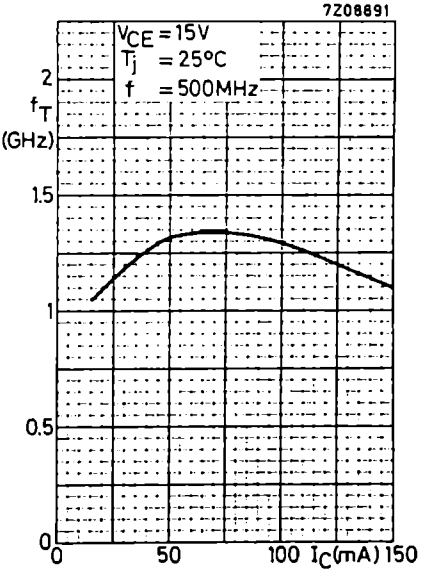

7Z08879
V_{CE} = 5V
T_j = 25°C
I_C (mA)
10^3
10^2
10
1
typ
max I_B
10
10^2
10^3
10^4
I_B (μA)
10^5

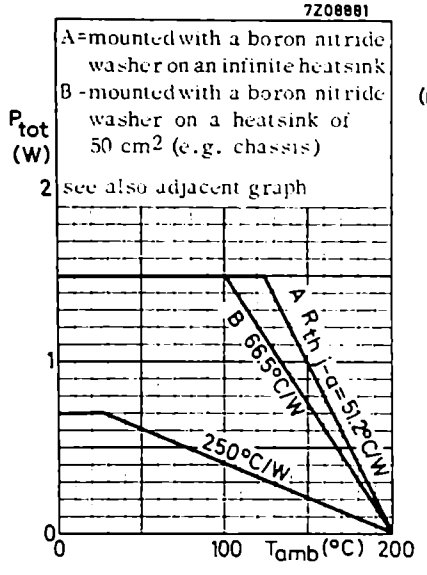

7Z08883
V_{CE} = 5V
T_j = 25°C
h_{FE}
80
60
40
20
0
typ
0
50
100
I_C(mA)
150

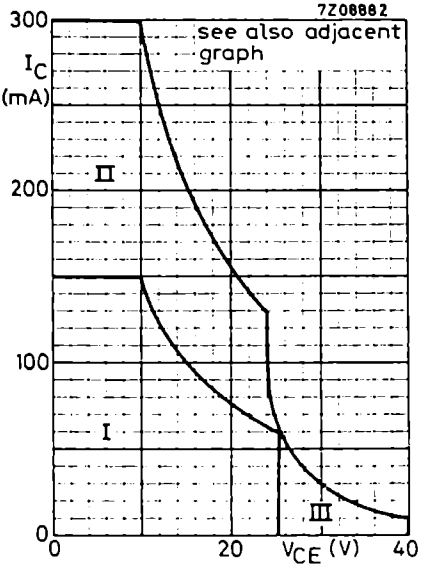

7Z08884
V_{CE} = 5V
T_j = 25°C
I_C (mA)
200
150
100
50
0
typ
700
800
V_{BE}(mV)
900


7Z08880
typical values
$T_j = 25°C$
3500μA
3000μA
2500μA
2000μA
1500μA
1000μA
I_B=500μA
I_C (mA)
150
100
50
0
0
5
10
15
20
V_{CE} (V)


7Z08885
$I_E = I_e = 0$
f = 1MHz
T_j = 25°C
typ.
C_c (pF)
8
6
4
2
0
0
10
20
V_{CB}(V)
30


7Z08891
V_{CE} = 15V
T_j = 25°C
f = 500MHz
f_T (GHz)
2
1.5
1
0.5
0
0
50
100
I_C(mA)
150





I = Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

II = Additional region of operation at $f \geq 1$ MHz

III Operating under pulsed conditions is allowed, provided the transistor is cut-off with $R_{BE} \leq 50\ \Omega$ and $f \geq 1$ MHz.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter transistor in a TO-72 metal envelope, with insulated electrodes and a shield lead connected to the case. The transistor has very low intermodulation distortion and very high power gain. It is primarily intended for:

- Wideband vertical amplifiers in high speed oscilloscopes.
- Wideband aerial amplifiers (40–860 MHz).
- Television distribution amplifiers.

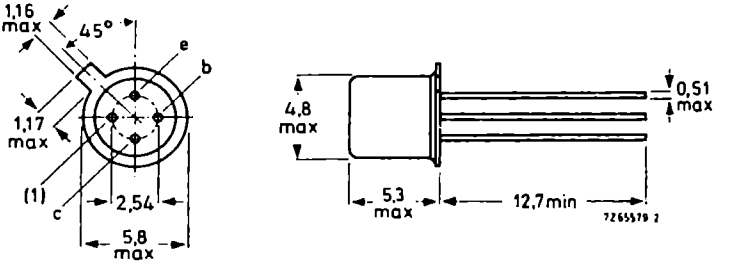
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	250	mW
Junction temperature	T_j	max.	200	°C
Feedback capacitance at f = 1 MHz I_C = 2 mA; V_{CE} = 5 V	C_{re}	typ.	0,8	pF
Transition frequency I_C = 50 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1,6	GHz
Power gain (not neutralized)			f = 200 | 800	MHz
I_C = 30 mA; V_{CE} = 5 V	G_p	typ.	21 | 7,5	dB
Intermodulation distortion I_C = 30 mA, V_{CE} = 6 V; R_L = 37,5 Ω; V_o = 100 mV at f_p = 183 MHz; V_o = 100 mV at f_q = 200 MHz; measured at $f_{(2q-p)}$ = 217 MHz	d_{im}	typ.	−60	dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	20	V
Collector-emitter voltage (open base)				
I_C = 10 mA	V_{CEO}	max.	10	V 2)
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5	V
Currents				
Collector current (d.c.)	I_C	max.	50	mA
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	100	mA
Power dissipation				
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	250	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0,7	°C/mW
From junction to case	$R_{th\ j-c}$		0,5	°C/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

$I_E = 0$; $V_{CB} = 10$ V — I_{CBO} < 50 nA

D.C. current gain

$I_C = 25$ mA; $V_{CE} = 5$ V — h_{FE} > 25

$I_C = 50$ mA; $V_{CE} = 5$ V — h_{FE} > 25

Transition frequency [1])

$I_C = 50$ mA; $V_{CE} = 5$ V; $f = 500$ MHz — f_T typ. 1.6 GHz

Collector capacitance at $f = 1$ MHz [2])

$I_E = I_c = 0$; $V_{CB} = 5$ V — C_c < 1.5 pF

Feedback capacitance at $f = 1$ MHz [1])

$I_C = 2$ mA; $V_{CE} = 5$ V — $-C_{re}$ typ. 0.8 pF

Noise figure [1])

$I_C = 2$ mA; $V_{CE} = 5$ V

$f = 500$ MHz; $R_S = 50\ \Omega$ — F < 5 dB

Power gain (not neutralized) [1])

$I_C = 30$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C — G_p

f =	200	800	MHz
>	19		dB
typ.	21	7.5	dB

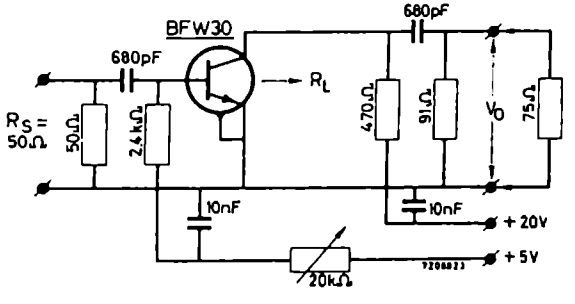
Intermodulation distortion [1])

$I_C = 30$ mA; $V_{CE} = 6$ V; $R_L = 37.5\ \Omega$; $T_{amb} = 25$ °C

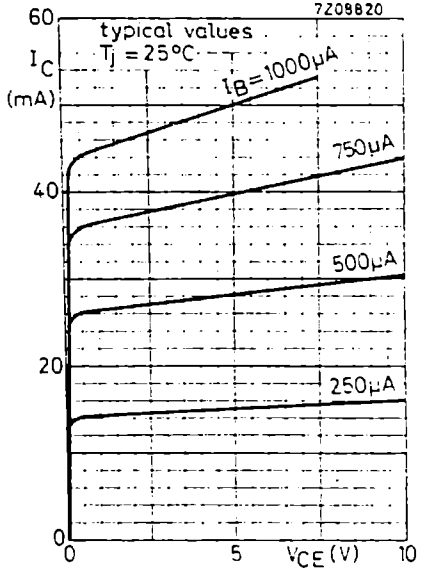
$V_o = 100$ mV at $f_p = 183$ MHz

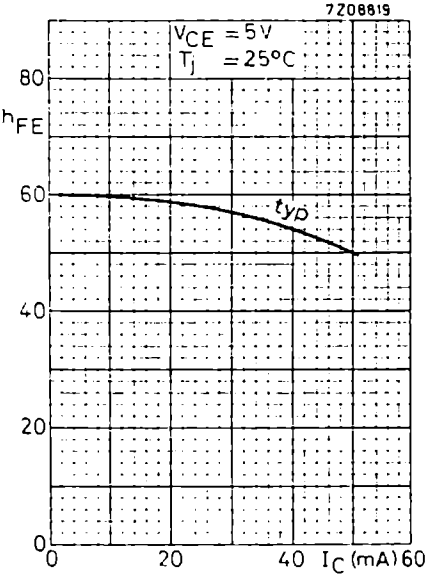
$V_o = 100$ mV at $f_q = 200$ MHz
measured at $f_{(2q-p)} = 217$ MHz — d_{im} typ. −60 dB

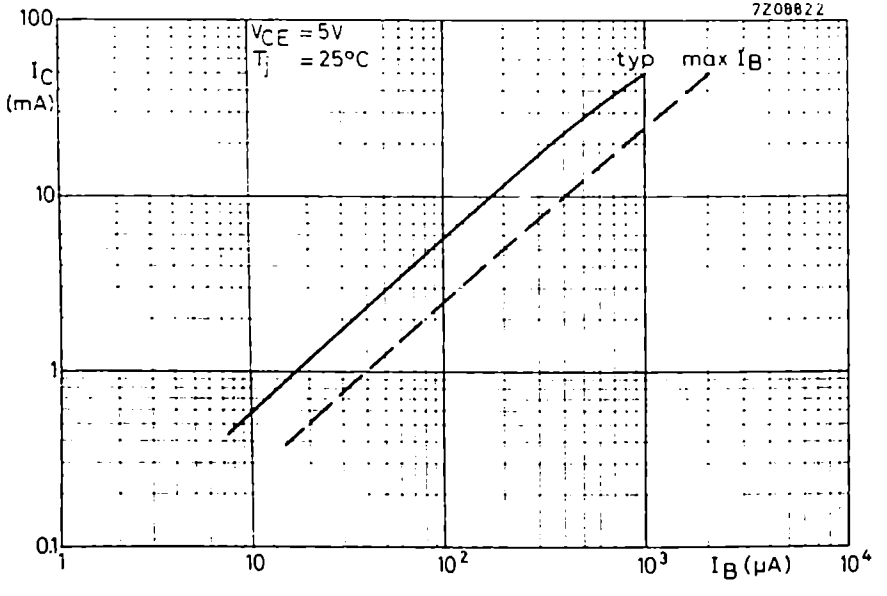
Test circuit

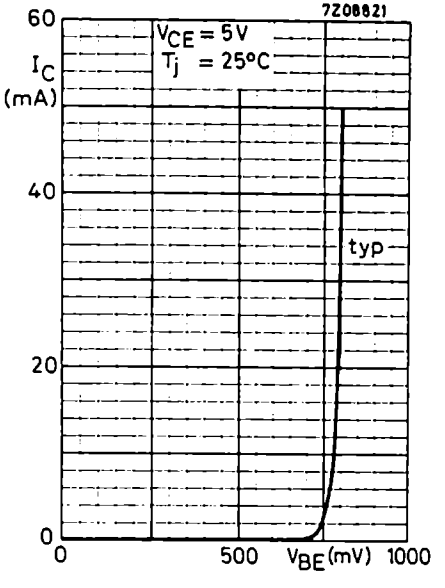


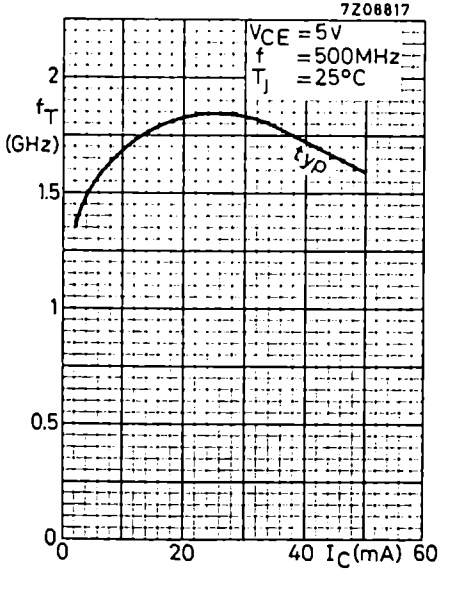
[1]) Shield lead grounded.
[2]) Shield lead not connected.

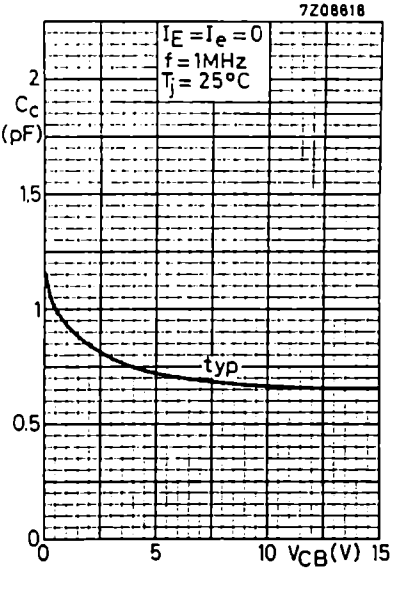

7Z08820
typical values
T_j = 25°C
I_C (mA)
I_B = 1000µA
750µA
500µA
250µA
60
40
20
0
0
5
V_{CE} (V)
10


7Z08819
V_{CE} = 5V
T_j = 25°C
h_{FE}
typ
80
60
40
20
0
0
20
40
I_C (mA)
60


7Z08822
V_{CE} = 5V
T_j = 25°C
typ
max I_B
I_C (mA)
100
10
1
0.1
1
10
10^2
10^3
I_B (µA)
10^4


7Z08821
60
I_C
(mA)
40
20
0
V_{CE} = 5V
T_j = 25°C
typ
0
500
V_{BE}(mV)
1000


7Z08817
V_{CE} = 5V
f = 500MHz
T_j = 25°C
2
f_T
(GHz)
1.5
1
0.5
0
typ
0
20
40
I_C(mA)
60


7Z08818
$I_E = I_e = 0$
f = 1MHz
T_j = 25°C
2
C_c
(pF)
1.5
1
0.5
0
typ
0
5
10
V_{CB}(V)
15

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic T-package. It has a low noise over a wide current range, a very high power gain and good intermodulation properties.
It is primarily intended for:

- Wideband aerial amplifiers (40 - 860 MHz)
- Channel and band aerial amplifiers for band I, II, III and IV/V (40 - 860 MHz)
- Television distribution amplifiers
- Low noise wideband vertical amplifier in high speed oscilloscopes

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.		25	V
Collector-emitter voltage (open base)	V_{CEO}	max.		15	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.		50	mA
Total power dissipation up to T_{amb} = 73 °C	P_{tot}	max.		190	mW
Junction temperature	T_j	max.		150	°C
Transition frequency at f = 500 MHz					
I_C = 25 mA; V_{CE} = 5 V	f_T	typ.		1,6	GHz
Feedback capacitance at f = 1 MHz					
I_C = 2 mA; V_{CE} = 5 V	C_{re}	typ.		0,6	pF
Noise figure at f = 500 MHz					
I_C = 2 mA; V_{CE} = 5 V	F	typ.		4	dB
			f = 200	800	MHz
Power gain (not neutralized)					
I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_p	typ.	23	11	dB
Output power at d_{im} = −30 dB					
VSWR at output < 2; I_C = 10 mA; V_{CE} = 10 V	P_o	typ.	8	8	mW

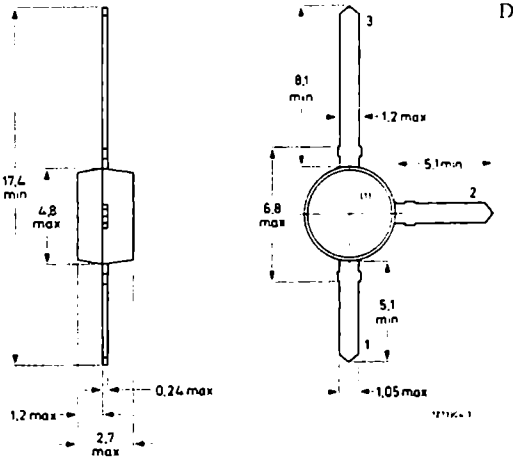
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

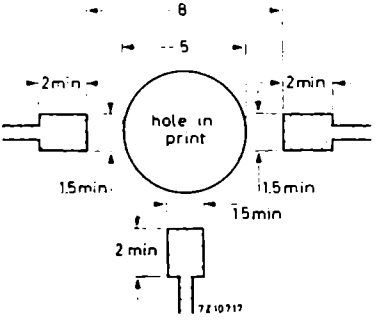
Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V [1]
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5	V
Currents				
Collector current (d.c.)	I_C	max.	25	mA
Collector current (peak value; $f \geq 1$ MHz)	I_{CM}	max.	50	mA
Power dissipation				
Total power dissipation up to $T_{amb} = 75$ °C	P_{tot}	max.	190	mW
Temperatures				
Storage temperature	T_{stg}		−65 to +150	°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a glass-fibre print *) of 40 mm x 25 mm x 1 mm	$R_{th\ j-a}$	0.4	°C/mW

*) Requirements for glass-fibre print

(dimensions in mm)



1) At $I_C = 10$ mA

CHARACTERISTICS

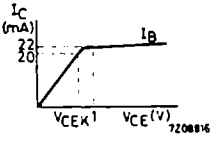
T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50	nA

Knee voltage [1])

I_C = 20 mA; I_B = value for which
I_C = 22 mA at V_{CE} = 1 V — V_{CEK} < 0.75 V



D.C. current gain

I_C = 2 mA; V_{CE} = 1 V	h_{FE}	>	20	
		<	150	
I_C = 25 mA; V_{CE} = 1 V [1])	h_{FE}	>	20	

Transition frequency at f = 500 MHz

I_C = 2 mA; V_{CE} = 5 V	f_T	typ.	1.0	GHz
I_C = 25 mA; V_{CE} = 5 V [1])	f_T	typ.	1.6	GHz

Collector capacitance at f = 1 MHz

I_E = I_e = 0; V_{CB} = 10 V	C_c	typ.	0.7	pF

Emitter capacitance at f = 1 MHz

I_C = I_c = 0; V_{EB} = 0.5 V	C_e	typ.	1.5	pF

Feedback capacitance at f = 1 MHz

I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	$-C_{re}$	typ.	0.6	pF

Noise figure at f = 500 MHz

I_C = 2 mA; V_{CE} = 5 V; R_S = 50 Ω; T_{amb} = 25 °C	F	typ.	4.0	dB

Power gain (not neutralized)

			f = 200 MHz	f = 800 MHz	
I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_p	typ.	23	11	dB

[1]) Measured under pulsed conditions.

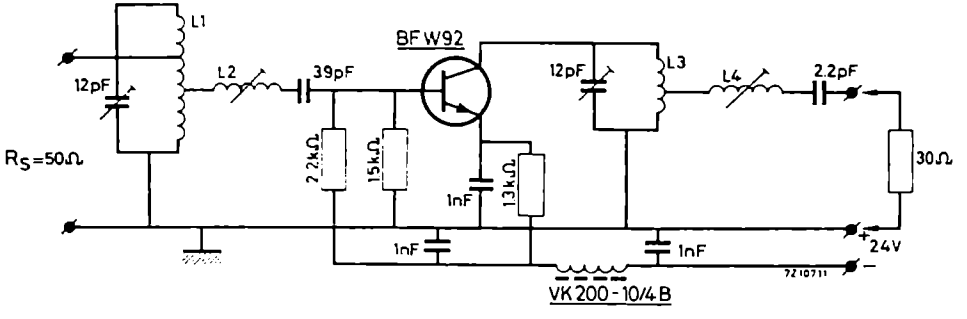
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics

1. Output power at f = 200 MHz: T_{amb} = 25 °C

I_C = 10 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (Channel 9) P_o typ. 8 mW

Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 11 mm.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C}.$$

in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
This is so if $-C_L = +C_{oe}$.
in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 820\ \Omega$; $C_L = -1.0$ pF

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 820 Ω resistor in parallel with a 1.0 pF capacitor between the collector and emitter connections of the output circuit.

2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1). After this adjustment, no further change may be made in the output circuit.

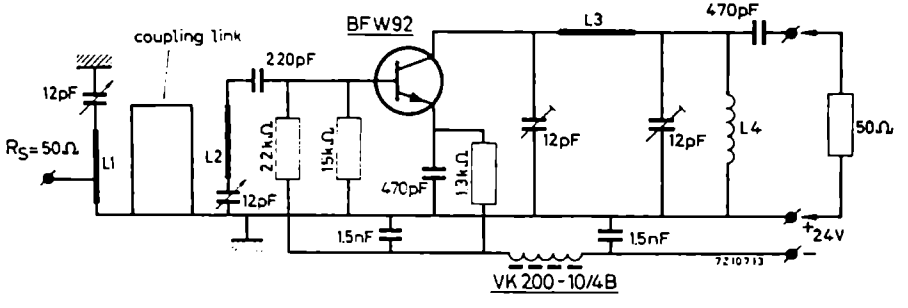
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
Corrections can be made by tuning L2; this will not disturb the band pass curve.

CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics

2. Output power at f = 800 MHz: T_{amb} = 25 °C

I_C = 10 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 806 MHz (Channel 62) P_o typ. 8 mW



Coil data:
L1 = 24 mm x 6 mm x 0.5 mm silver plated Cu strip.
Tap of the input at 5 mm from earth.
L2 = 15 mm x 6 mm x 0.5 mm silver plated Cu strip.
L3 = 20 mm x 5 mm x 0.5 mm silver plated Cu strip.
L4 = 4 turns enamelled Cu wire (0.5 mm); winding pitch 1.5 mm; int. diam. 4 mm
Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment.

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearily with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C (V_{CE} - V_{CEK})}{2} = 40 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 40 mW.
After this adjustment has been made no further change may be made in the output circuit.
Adjust the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output is then ≤ 2 over the whole channel.

CHARACTERISTICS (continued)

Intermodulation characteristics

3. Intermodulation distortion

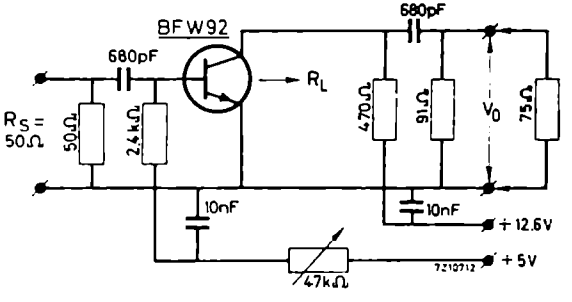
I_C = 10 mA; V_{CE} = 6 V; R_L = 37.5 Ω; T_{amb} = 25 °C

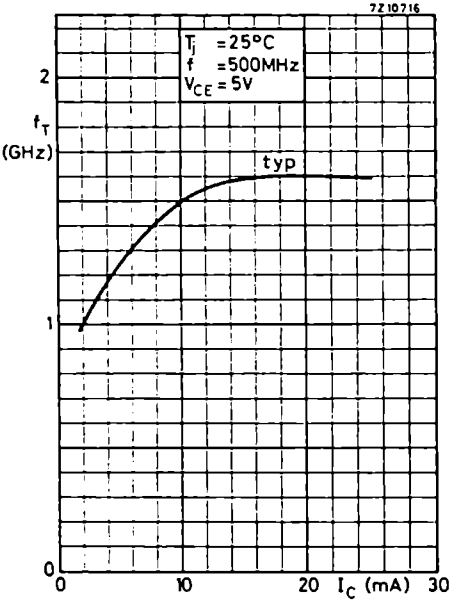
V_0 = 100 mV at f_p = 153 MHz

V_0 = 100 mV at f_q = 200 MHz

measured at $f_{(2q-p)}$ = 247 MHz d_{im} typ. −45 dB

Test circuit:




7Z10716
T_j = 25°C
f = 500MHz
V_{CE} = 5V
typ
f_T (GHz)
2
1
0
0
10
20
I_C (mA)
30

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.
The device is intended for use in v.h.f. - u.h.f. applications, primarily wideband aerial amplifiers 40 - 800 MHz.
It is intended for mounting on miniature printed-circuit boards.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	18	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	100	mA
Total power dissipation up to T_{amb} = 73 °C	P_{tot}	max.	190	mW
Junction temperature	T_j	max.	150	°C
Feedback capacitance at f = 1 MHz				
I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,6	pF
Transition frequency at f = 500 MHz				
I_C = 50 mA; V_{CE} = 5 V	f_T	typ.	1,7	GHz
Max. unilateral power gain (see page 3)				
I_C = 50 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	typ.	22	dB
I_C = 50 mA; V_{CE} = 5 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	10,5	dB
Intermodulation distortion at T_{amb} = 25 °C				
I_C = 50 mA; V_{CE} = 5 V; R_L = 37,5 Ω				
V_O = 100 mV at f_p = 183 MHz				
V_O = 100 mV at f_q = 200 MHz				
measured at $f_{(2q-p)}$ = 217 MHz	d_{im}	typ.	−60	dB

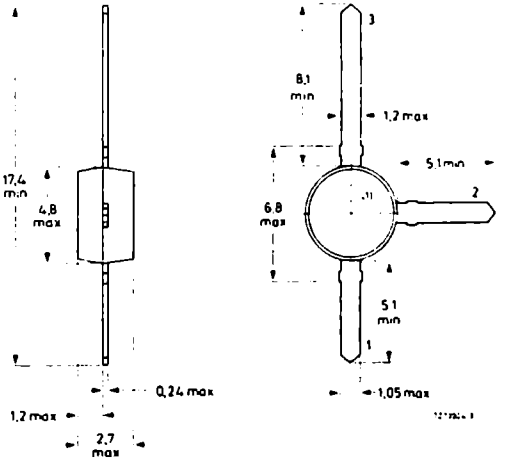
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

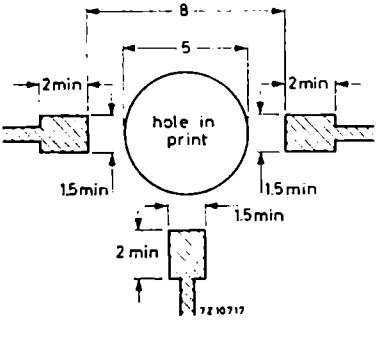
RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	18	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5	V
Currents				
Collector current (d.c.)	I_C	max.	50	mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	100	mA
Power dissipation				
Total power dissipation up to $T_{amb} = 73\ ^{o}C$	P_{tot}	max.	190	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +150		°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a glass-fibre print of 40 mm x 25 mm x 1 mm	$R_{th\ j-a}$	0.4	°C/mW

Requirements for glass-fibre print (dimensions in mm)



CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_E = 0$; $V_{CB} = 10$ V	I_{CBO}	<	50	nA
D.C. current gain [1]				
$I_C = 25$ mA; $V_{CE} = 5$ V	h_{FE}	>	25	
$I_C = 50$ mA; $V_{CE} = 5$ V	h_{FE}	>	25	
Transition frequency at f = 500 MHz [1]				
$I_C = 50$ mA; $V_{CE} = 5$ V	f_T	typ.	1.7	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 5$ V	C_c	typ.	0.7	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c = 0$; $V_{EB} = 0.5$ V	C_e	typ.	1.5	pF
Feedback capacitance at f = 1 MHz				
$I_C = 2$ mA; $V_{CE} = 5$ V; $T_{amb} = 25$ °C	$-C_{re}$	typ.	0.6	pF
Noise figure at f = 500 MHz				
$I_C = 2$ mA; $V_{CE} = 5$ V; $G_S = 20$ mA/V				
B_S is tuned; $T_{amb} = 25$ °C	F	<	5	dB

► Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 30$ mA; $V_{CE} = 5$ V; f = 200 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	22	dB
$I_C = 30$ mA; $V_{CE} = 5$ V; f = 800 MHz; $T_{amb} = 25$ °C	G_{UM}	typ.	10.5	dB

[1] Measured under pulse conditions.

CHARACTERISTICS (continued)

Intermodulation distortion at T_{amb} = 25 °C

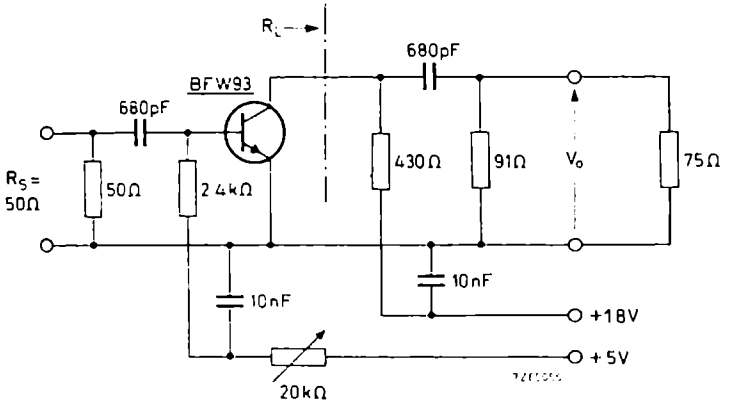
I_C = 30 mA; V_{CE} = 5 V; R_L = 37.5 Ω

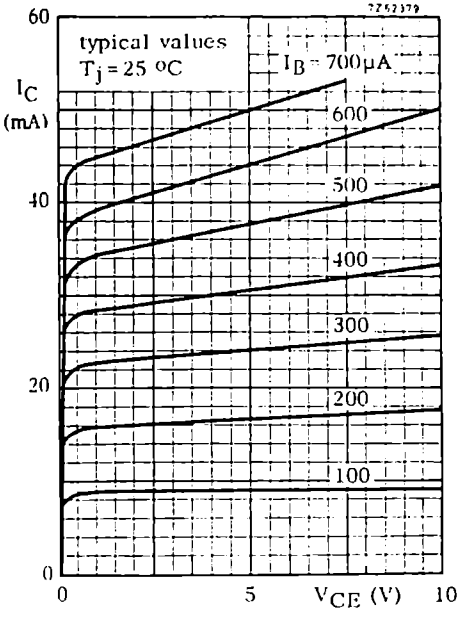
V_o = 100 mV at f_p = 183 MHz

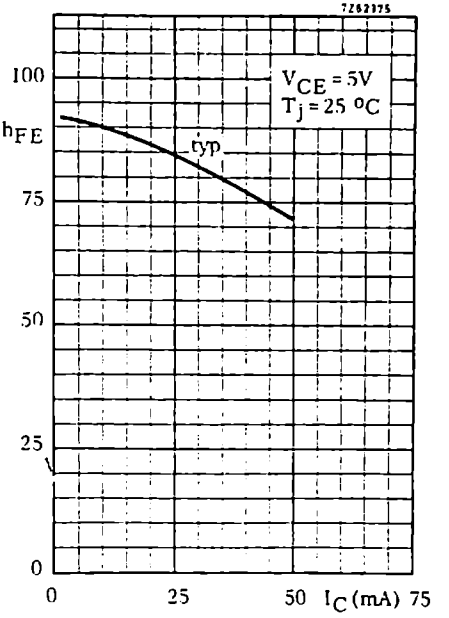
V_o = 100 mV at f_q = 200 MHz

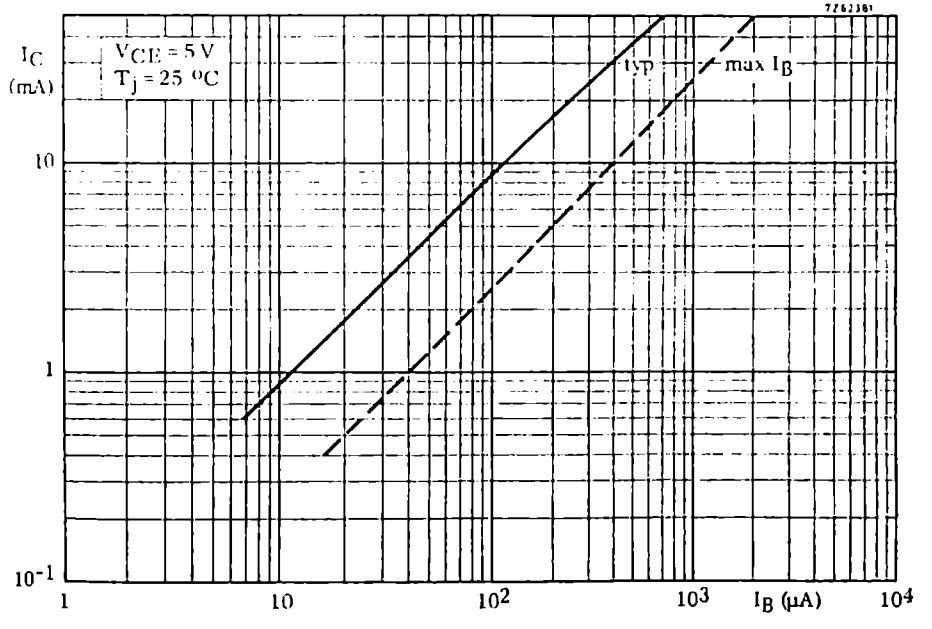
measured at $f_{(2q-p)}$ = 217 MHz d_{im} typ. −60 dB

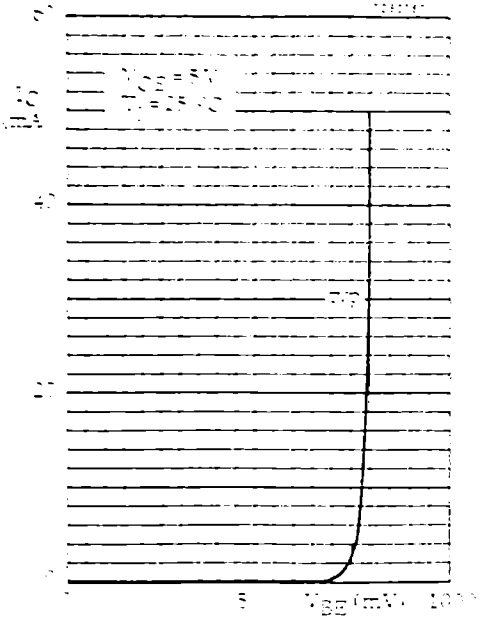
Test circuit :

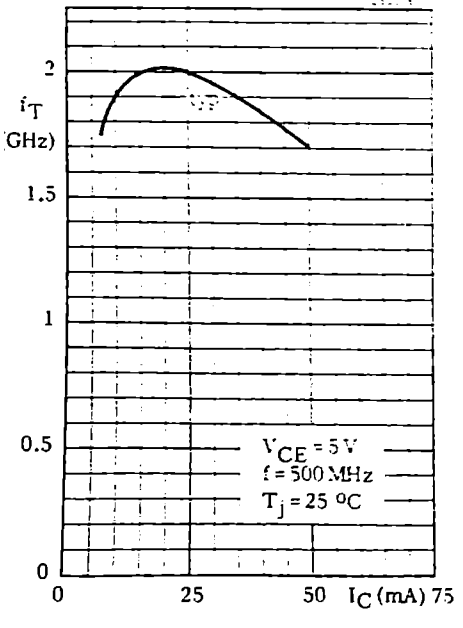


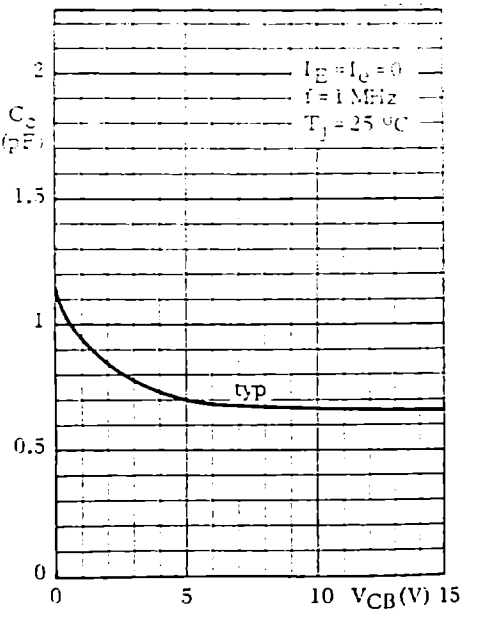

7Z62379
typical values
T_j = 25 °C
I_B = 700 µA
600
500
400
300
200
100
I_C (mA)
60
40
20
0
0
5
V_{CE} (V)
10

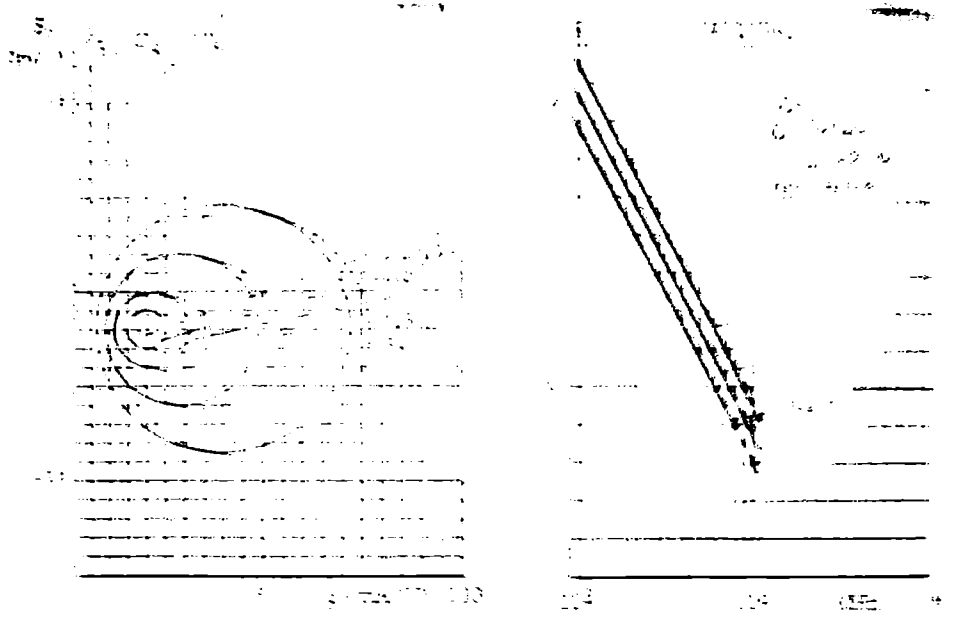

7Z62375
V_{CE} = 5V
T_j = 25 °C
typ
h_{FE}
100
75
50
25
0
0
25
50
I_C (mA)
75

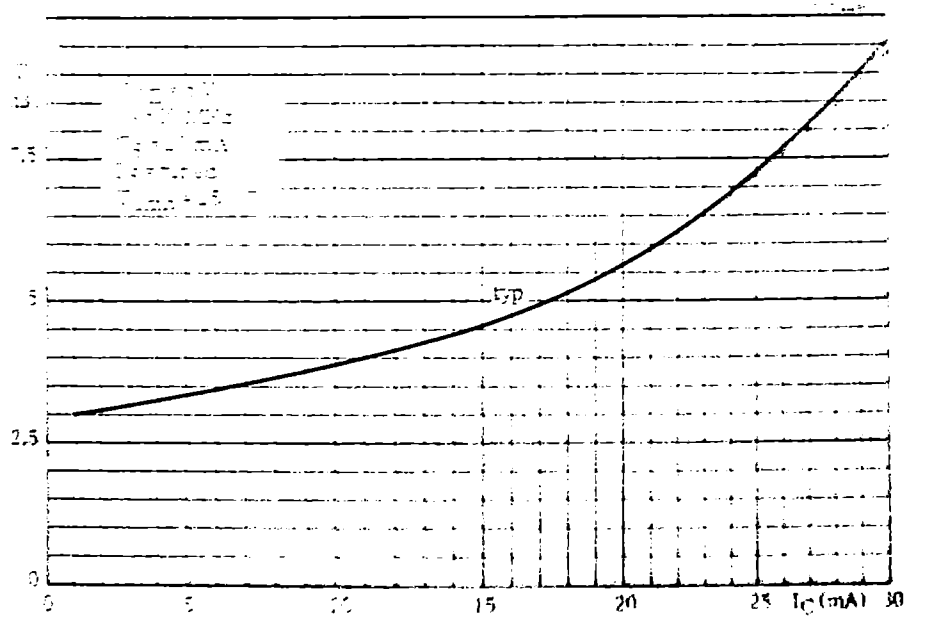

7Z62381
V_{CE} = 5 V
T_j = 25 °C
typ
max I_B
I_C (mA)
10
1
10^{-1}
1
10
10^2
10^3
I_B (µA)
10^4




2
1.5
1
0.5
0
f_T (GHz)
typ
V_{CE} = 5 V
f = 500 MHz
T_j = 25 °C
0
25
50
I_C (mA)
75


2
1.5
1
0.5
0
C_c (pF)
$I_E = I_e = 0$
f = 1 MHz
T_j = 25 °C
typ
0
5
10
V_{CB} (V)
15

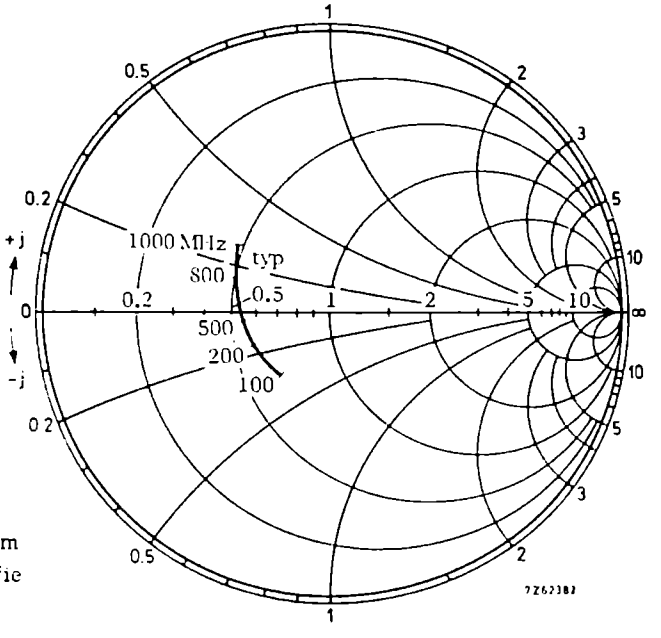



7,5
5
typ
2,5
0
0
5
15
20
25
I_C (mA)
30

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C

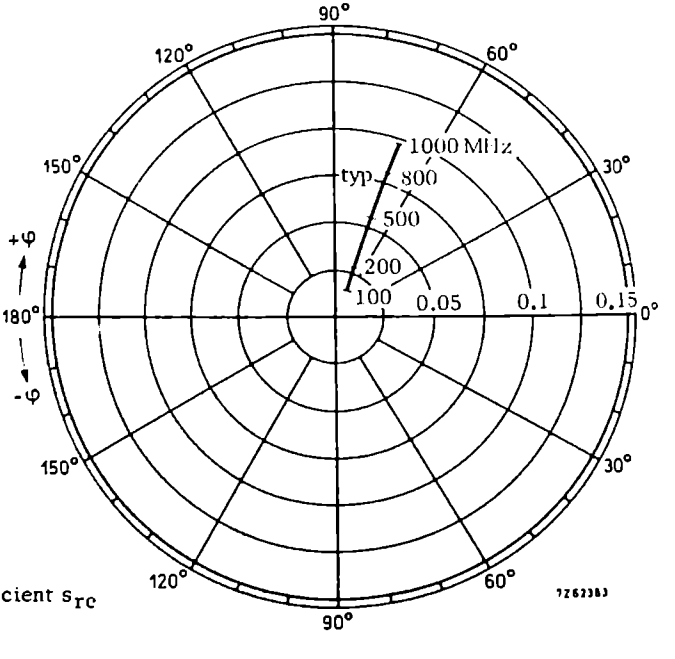


Input impedance derived from input reflection coefficient s_{ie} coordinates in ohm x 50

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C

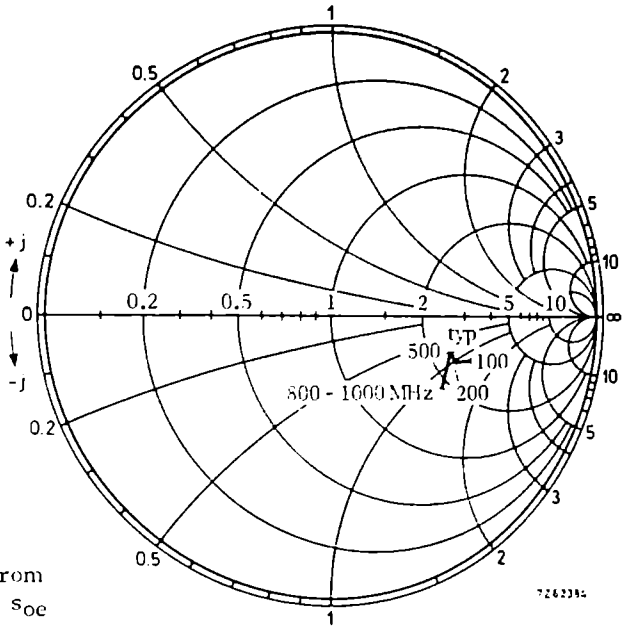


Reverse transmission coefficient s_{re}

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C

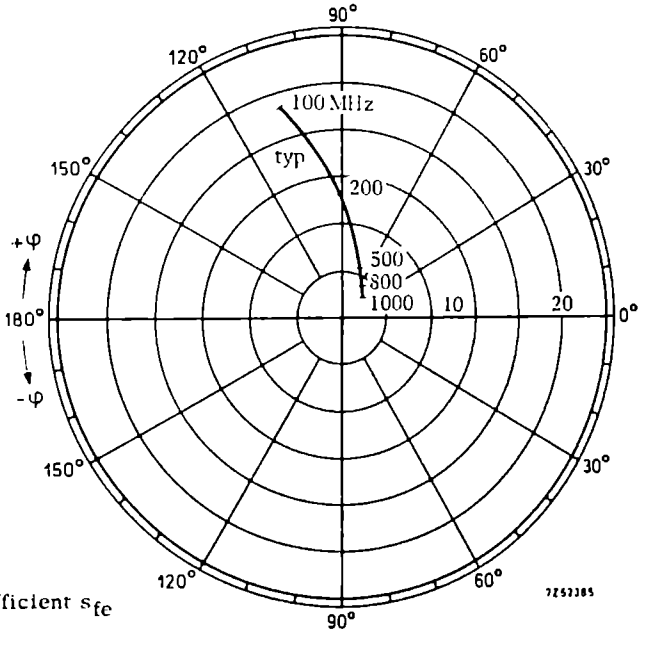


Output impedance derived from output reflection coefficient s_{oe} coordinates in ohm x 50

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C



Forward transmission coefficient s_{fe}

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope, with insulated electrodes and a shield lead connected to the case. The transistor has a low noise, a very high power gain and good intermodulation properties. It is primarily intended for:

- Channel aerial amplifiers for bands I, II, III and IV/V (40–860 MHz).
- Wideband aerial amplifiers (40–860 MHz).

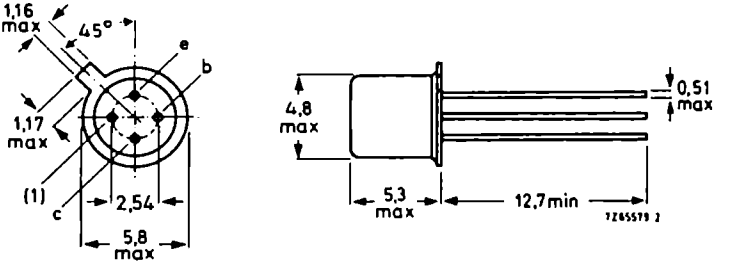
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.		30	V
Collector-emitter voltage (open base)	V_{CEO}	max.		15	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.		50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.		200	mW
Junction temperature	T_j	max.		200	°C
Transition frequency I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.		1,2	GHz
Feedback capacitance I_C = 2 mA; V_{CE} = 5 V; f = 1 MHz	C_{re}	typ.		0,6	pF
			f = 200	800	MHz
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V	F	typ.	3,3	7	dB
Power gain (not neutralized) I_C = 8 mA; V_{CE} = 10 V	G_p	typ.	22	7	dB
Output power d_{im} = −30 dB; VSWR at output < 2; I_C = 8 mA; V_{CE} = 10 V	P_o	typ.	6	6	mW

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30	V
Collector-emitter voltage (peak value) $R_{BE} \leq 50\ \Omega$	V_{CERM}	max.	30	V [1]
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V [1]
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5	V
Currents				
Collector current (d.c.)	I_C	max.	25	mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	50	mA
Power dissipation				
Total power dissipation up to $T_{amb} = 25\ ^oC$	P_{tot}	max.	200	mW
Temperatures				
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	0.88	°C/mW
From junction to case	$R_{th\ j-c}$	=	0.58	°C/mW

[1] I_C = 10 mA.

CHARACTERISTICS

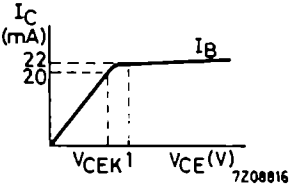
T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 15 V	I_{CBO}	<	10	nA

Knee voltage

I_C = 20 mA; I_B = value for which I_C = 22 mA at V_{CE} = 1 V	V_{CEK}	<	0.75	V



D.C. current gain

I_C = 2 mA; V_{CE} = 1 V	h_{FE}	20 to 150		
I_C = 25 mA; V_{CE} = 1 V	h_{FE}	20 to 125		

Transition frequency [1])

I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.0	GHz
I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.2	GHz

Collector capacitance at f = 1 MHz [2])

$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	<	1.7	pF

Feedback capacitance at f = 1 MHz [1])

I_C = 2 mA; V_{CE} = 5 V	$-C_{re}$	typ.	0.6	pF

Noise figure [1])

I_C = 2 mA; V_{CE} = 5 V				
f = 200 MHz; optimum source impedance	F	<	4	dB
f = 500 MHz; R_S = 50 Ω	F	<	6.5	dB
f = 800 MHz; optimum source impedance	F	typ.	7.0	dB

Power gain (not neutralized) [1])

			f = 200	800	MHz
I_C = 8 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_p	>	19	-	dB
		typ.	22	7	dB

1) Shield lead grounded.
2) Shield lead not connected.

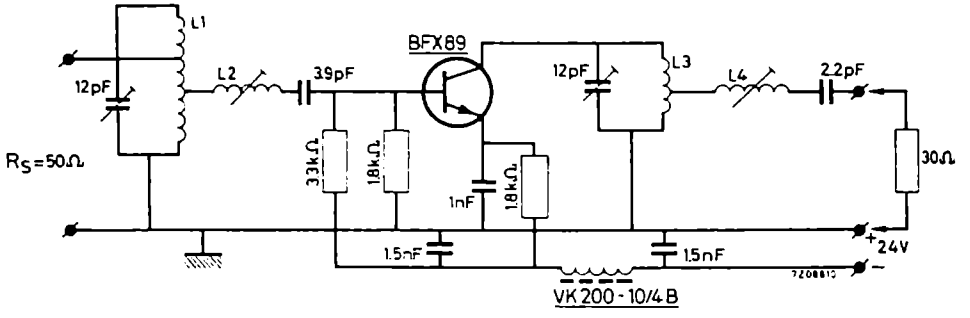
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics [1])

1. Output power at f = 200 MHz; T_{amb} = 25 °C

I_C = 8 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (Channel 9) P_o typ. 6 mW

Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 5 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 5 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm) winding pitch 3.3 mm; int. diam. 5 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm) winding pitch 2.2 mm; int. diam. 11 mm.

1) Shield lead grounded.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
This is so if $-C_L = +C_{oe}$,
in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 1\ k\Omega$; $C_L = -1.8\ pF$

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 1 kΩ resistor in parallel with a 1.8 pF capacitor between the collector and emitter connections of the output circuit.

2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1). After this adjustment, no further change may be made in the output circuit.

3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
Corrections can be made by tuning L2; this will not disturb the band pass curve.

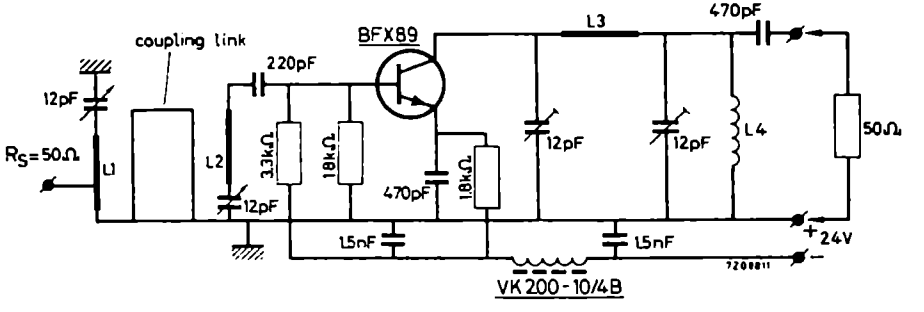
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics [1])

2. Output power at f = 800 MHz; T_{amb} = 25 °C

I_C = 8 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 806 MHz (Channel 62) P_o typ. 6 mW

Test circuit:



Coil data:

L1 = 24 mm x 6 mm x 0.5 mm silver plated Cu strip.
Tap of the input at 5 mm from earth.
L2 = 15 mm x 6 mm x 0.5 mm silver plated Cu strip.
L3 = 20 mm x 5 mm x 0.5 mm silver plated Cu strip.
L4 = 4 turns enamelled Cu wire (0.5 mm); winding pitch 1.5 mm; int. diam. 4 mm.
Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C (V_{CE} - V_{CEK})}{2} - 35 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 35 mW.
After this adjustment has been made no further change may be made in the output circuit.
Adjust the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output is then ≤ 2 over the whole channel.

[1]) Shield lead grounded

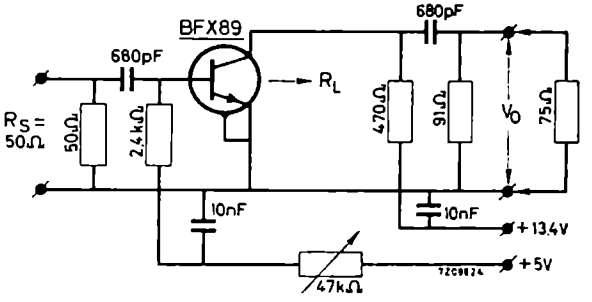
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

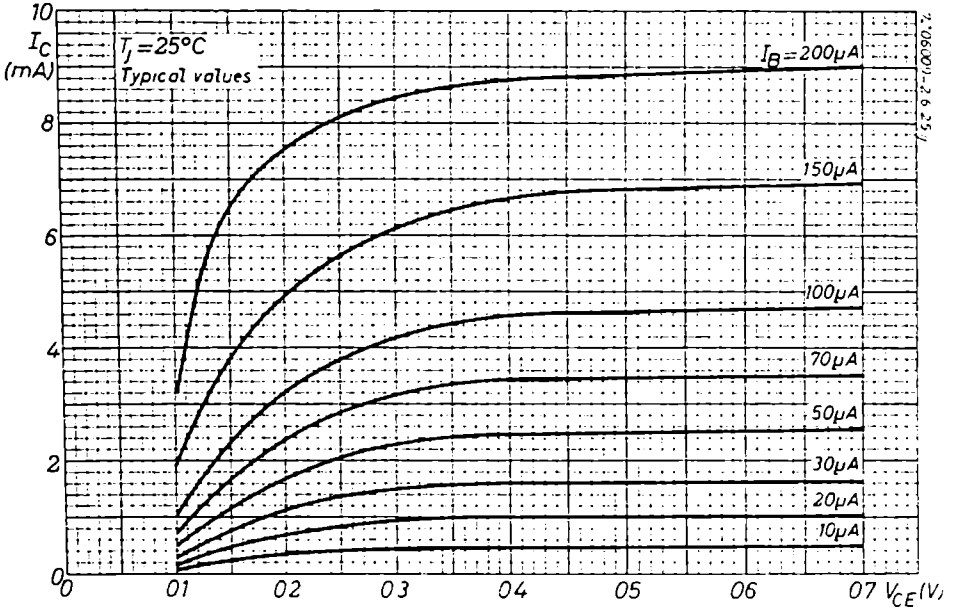
Intermodulation characteristics [1])

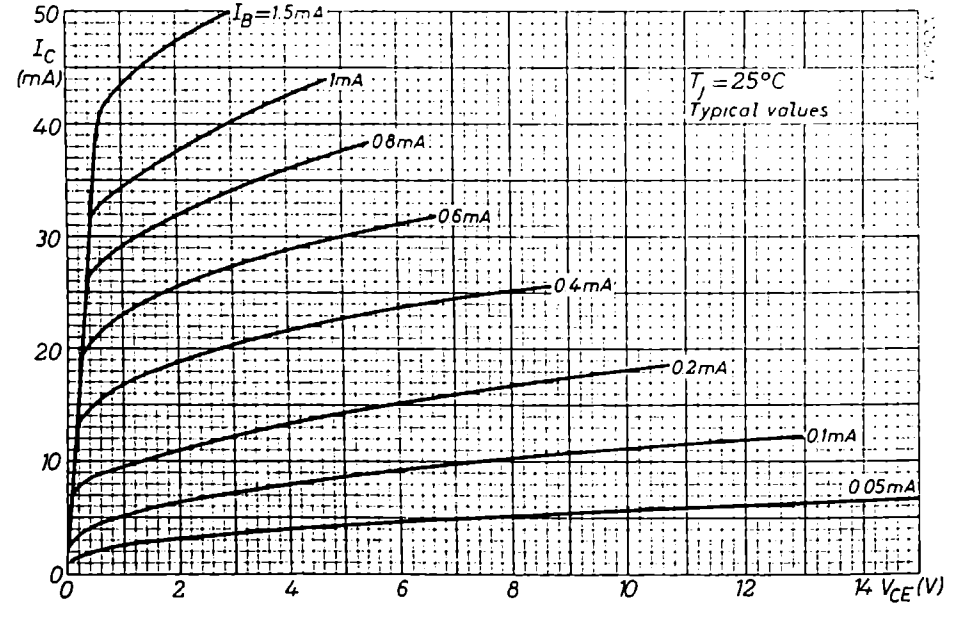
3. Intermodulation distortion

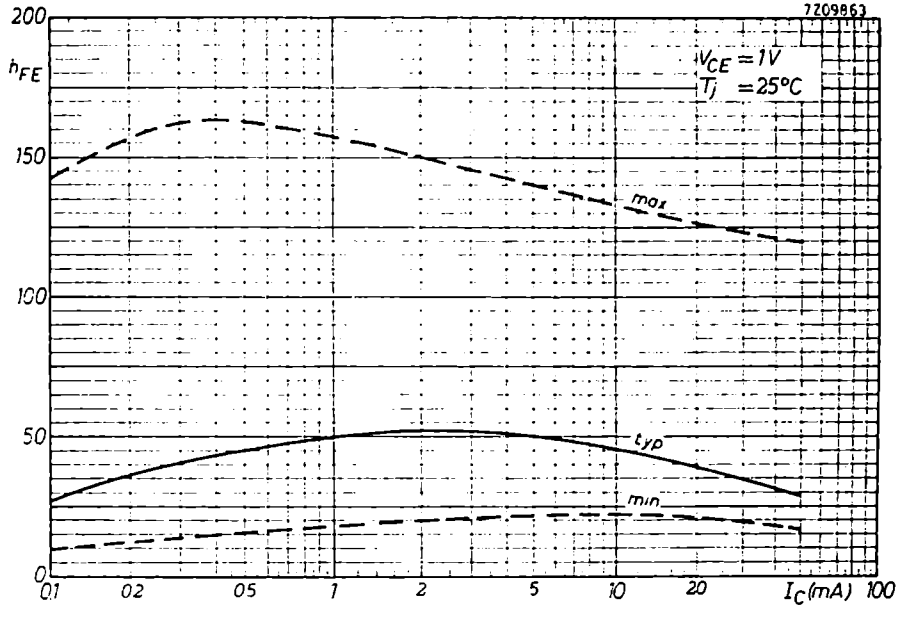
I_C = 8 mA; V_{CE} = 6 V; R_L = 37.5 Ω; T_{amb} = 25 °C
V_o = 100 mV at f_p = 183 MHz
V_o = 100 mV at f_q = 200 MHz
measured at $f_{(2q-p)}$ = 217 MHz d_{im} typ. −40 dB

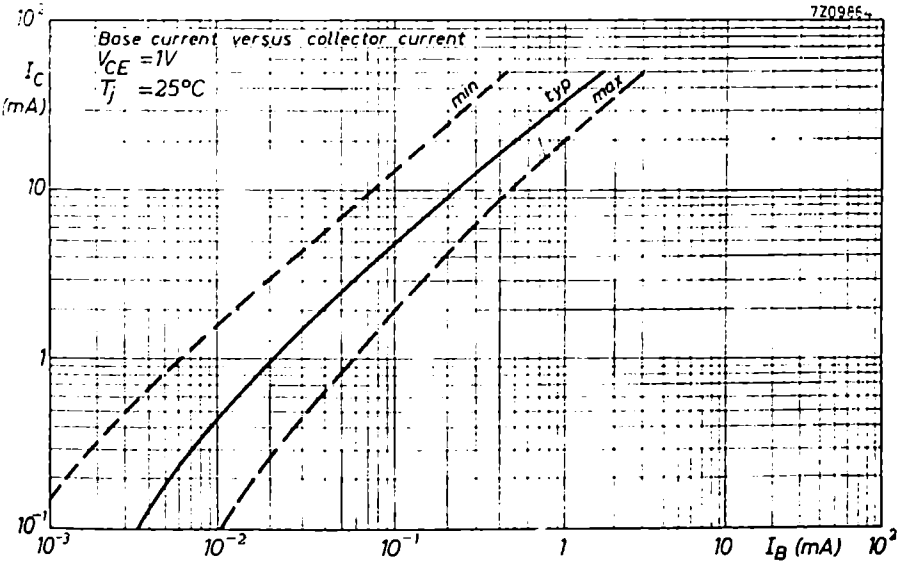
Test circuit:

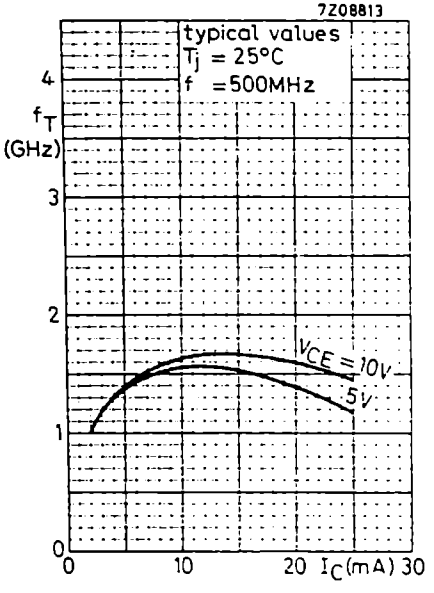


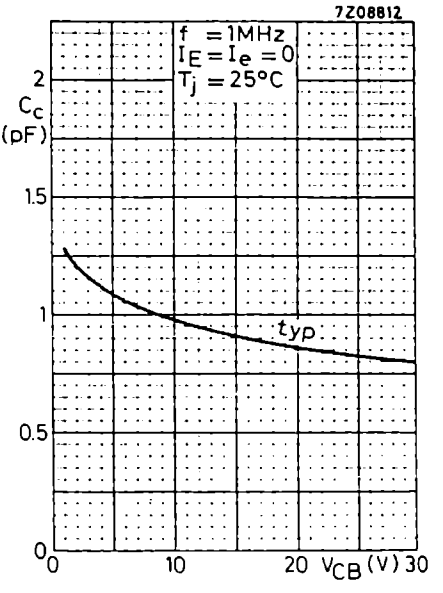

10
I_C (mA)
T_j=25°C
Typical values
I_B=200μA
150μA
100μA
70μA
50μA
30μA
20μA
10μA
8
6
4
2
0
0
01
02
03
04
05
06
07 V_{CE}(V)

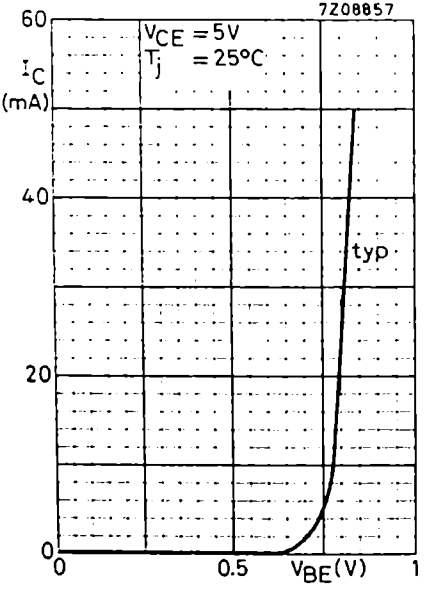

50
I_C (mA)
I_B=1.5mA
1mA
0.8mA
0.6mA
0.4mA
0.2mA
0.1mA
0.05mA
T_j=25°C
Typical values
40
30
20
10
0
0
2
4
6
8
10
12
14 V_{CE}(V)

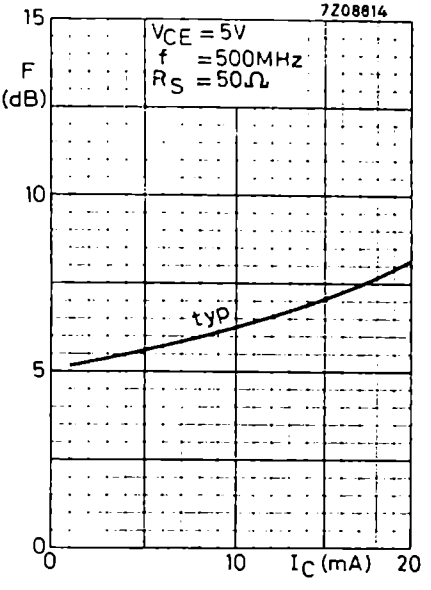

7Z09863
200
h_{FE}
150
100
50
0
0.1
0.2
0.5
1
2
5
10
20
I_C(mA)
100
V_{CE} = 1V
T_j = 25°C
max
typ
min

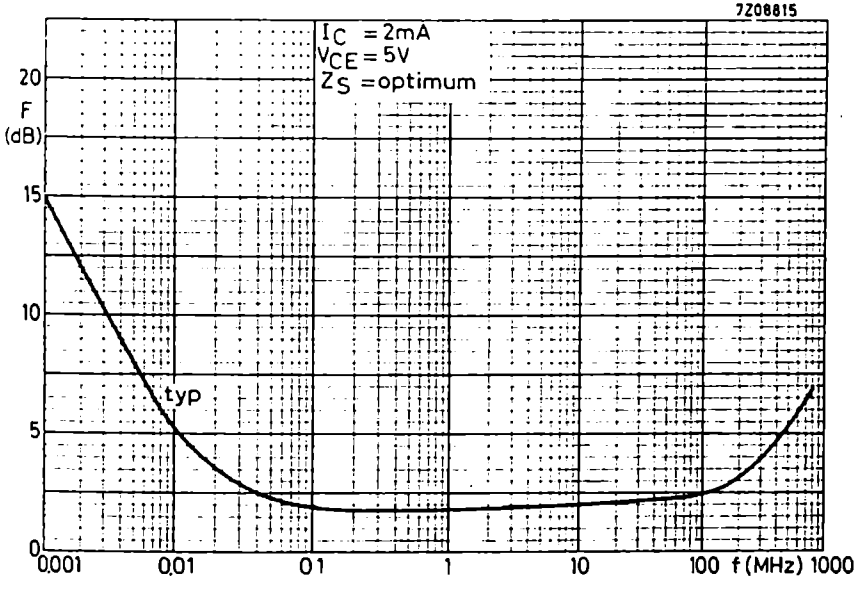

7Z09865
Base current versus collector current
V_{CE} = 1V
T_j = 25°C
I_C (mA)
10
1
10^{-1}
10^{-3}
10^{-2}
10^{-1}
1
10
I_B (mA)
10^2
min
typ
max


7Z08813
typical values
T_j = 25°C
f = 500MHz
f_T (GHz)
V_{CE} = 10V
5V
I_C (mA)


7Z08812
f = 1MHz
$I_E = I_e = 0$
T_j = 25°C
C_c (pF)
typ
V_{CB} (V)


7Z08857
V_{CE} = 5V
T_j = 25°C
I_C (mA)
typ
V_{BE} (V)


7Z08814
V_{CE} = 5V
f = 500MHz
R_S = 50Ω
F (dB)
15
10
5
0
typ
0
10
I_C (mA)
20


7Z08815
I_C = 2mA
V_{CE} = 5V
Z_S = optimum
F (dB)
20
15
10
5
0
typ
0.001
0.01
0.1
1
10
100
f (MHz)
1000

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case.
The transistor has very low noise over a wide current range, a very high power gain and excellent intermodulation properties.

It is primarily intended for:

- Channel- and band aerial amplifiers for band I, II, III and IV/V (40-860 MHz)
- Wide band aerial amplifiers (40-860 MHz)
- Television distribution amplifiers
- Low noise wide band vertical amplifier in high speed oscilloscopes

It is also suitable for military- and industrial applications, such as:

- R.F. amplifiers and mixers for communication equipment
- Microwave telephony link systems, wide band i.f. amplifiers
- Large bandwidth radar i.f. amplifiers

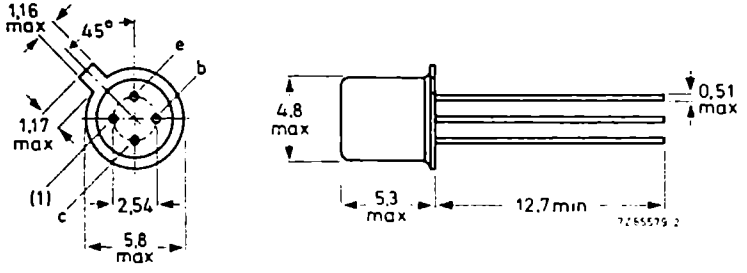
QUICK REFERENCE DATA				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (peak value; f ≥ 1 MHz)	I_{CM}	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	200	°C
Transition frequency I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.4	GHz
Feedback capacitance at f = 1 MHz I_C = 2 mA; V_{CE} = 5 V	C_{re}	typ.	0.6	pF
Noise figure at optimum source impedance		f = 200	800	MHz
I_C = 2 mA; V_{CE} = 5 V	F	typ. 2.5	5.5	dB
Power gain (not neutralized) I_C = 14 mA; V_{CE} = 10 V	G_p	typ. 23	6	dB
Output power d_{im} = −30 dB; V.S.W.R. at output < 2 I_C = 14 mA; V_{CE} = 10 V	P_o	typ. 12	12	mW

MECHANICAL DATA see page 2.

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30 V
Collector-emitter voltage (peak value) $R_{BE} \leqslant 50\ \Omega$; $I_C = 10$ mA	V_{CERM}	max.	30 V
Collector-emitter voltage (open base); $I_C = 10$ mA	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 25\ ^oC$	P_{tot}	max.	200 mW
Storage temperature	T_{stg}		−65 to + 200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	880 K/W*
From junction to case	$R_{th\ j\text{-}c}$	=	580 K/W*

* K/W is SI unit for °C/W.

CHARACTERISTICS

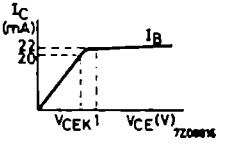
T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 15 V	I_{CBO}	<	10	nA

Knee voltage

I_C = 20 mA; I_B = value for which I_C = 22 mA at V_{CE} = 1 V	V_{CEK}	<	0.75	V



D.C. current gain

I_C = 2 mA; V_{CE} = 1 V	h_{FE}		25 to 150	
I_C = 25 mA; V_{CE} = 1 V	h_{FE}		20 to 125	

Transition frequency [1]

I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz	f_T	>	1.0	GHz
		typ.	1.1	GHz
I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	>	1.3	GHz
		typ.	1.4	GHz

Collector capacitance at f = 1 MHz [2]

$I_E = I_c = 0$; V_{CB} = 10 V	C_c	<	1.5	pF

Feedback capacitance at f = 1 MHz [1]

I_C = 2 mA; V_{CE} = 5 V	$-C_{re}$	typ.	0.6	pF
		<	0.8	pF

Noise figure [1]

I_C = 2 mA; V_{CE} = 5 V				
f = 100 kHz; optimum source resistance	F	<	4	dB
f = 200 MHz; optimum source impedance	F	<	3.5	dB
f = 500 MHz; R_S = 50 Ω	F	<	5	dB
f = 800 MHz; optimum source impedance	F	typ.	5.5	dB

			f = 200	800	MHz
Power gain (not neutralized) [1]					
I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_p	>	21		dB
		typ.	23	8	dB

1) Shield lead grounded.

2) Shield lead not connected.

CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

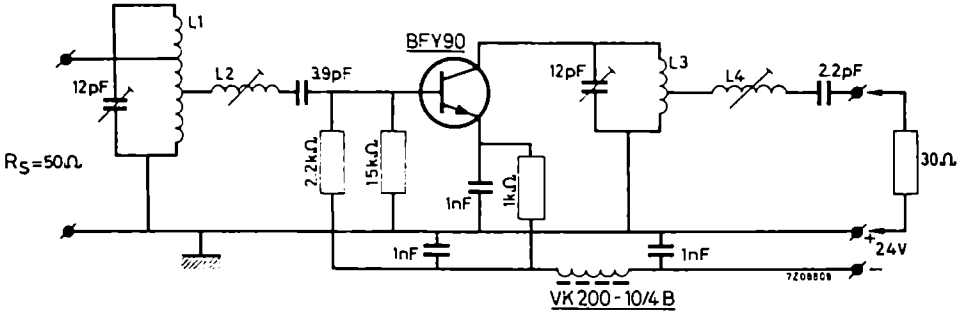
Intermodulation characteristics [1])

1. Output power at f = 200 MHz; T_{amb} = 25 °C

I_C = 14 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (Channel 9)

P_o > 10 mW
typ. 12 mW

Test circuit:



Coil data:

L1 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 3 turns silver plated Cu wire (1.4 mm); winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 11 mm.

[1]) Shield lead grounded

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
   This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

   in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 560\ \Omega$; $C_L = -1.8$ pF

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 560 Ω resistor in parallel with a 1.8 pF capacitor between the collector and emitter connections of the output circuit.

2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1).
   After this adjustment, no further change may be made in the output circuit.

3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
   The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
   Corrections can be made by tuning L2; this will not disturb the band pass curve.

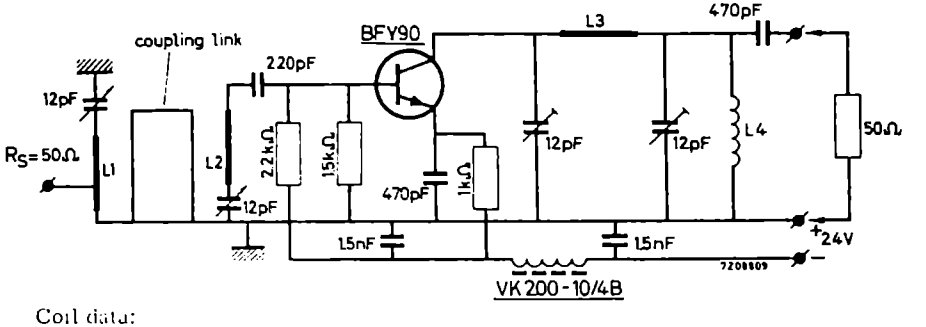
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics [1])

2. Output power at f = 800 MHz; T_{amb} = 25 °C

I_C = 14 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 806 MHz (Channel 62) P_o typ. 12 mW

Test circuit:



Coil data:

L1 = 24 mm x 6 mm x 0.5 mm silver plated Cu strip.
Tap of the input at 5 mm from earth.
L2 = 15 mm x 6 mm x 0.5 mm silver plated Cu strip.
L3 = 20 mm x 5 mm x 0.5 mm silver plated Cu strip.
L4 = 4 turns enamelled Cu wire (0.5 mm); winding pitch 1.5 mm; int. diam. 4 mm
Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment.

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C (V_{CE} - V_{CEK})}{2} = 60 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 60 mW.
After this adjustment has been made no further change may be made in the output circuit.
Adjust the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output is then ≤ 2 over the whole channel.

[1]) Shield lead grounded

CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics [1])

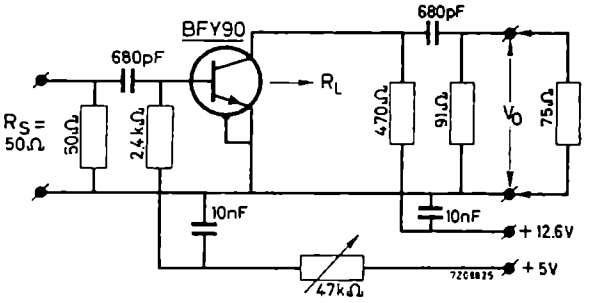
3. Intermodulation distortion

I_C = 14 mA; V_{CE} = 6 V; R_L = 37.5 Ω; T_{amb} = 25 °C

V_o = 100 mV at f_p = 183 MHz

V_o = 100 mV at f_q = 200 MHz
measured at $f_{(2q-p)}$ = 217 MHz d_{im} typ. −50 dB

Test circuit:



y parameters at f = 500 MHz (common emitter) [1])

I_C = 2 mA; V_{CE} = 5 V

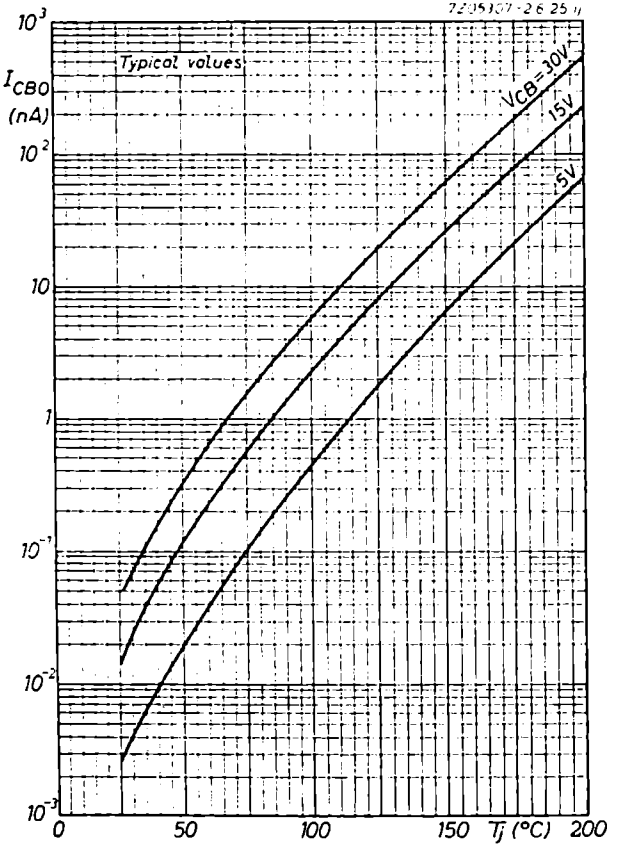
Input conductance	g_{ie}	typ.	10	mΩ^{-1}
Input capacitance	C_{ie}	typ.	3.75	pF
Feedback admittance	$\|y_{re}\|$	typ.	1.55	mΩ^{-1}
Phase angle of feedback admittance	φ_{re}	typ.	258°	
Transfer admittance	$\|y_{fe}\|$	typ.	45	mΩ^{-1}
Phase angle of transfer admittance	φ_{fe}	typ.	285°	
Output conductance	g_{oe}	typ.	0.19	mΩ^{-1}
Output capacitance	C_{oe}	typ.	1.9	pF

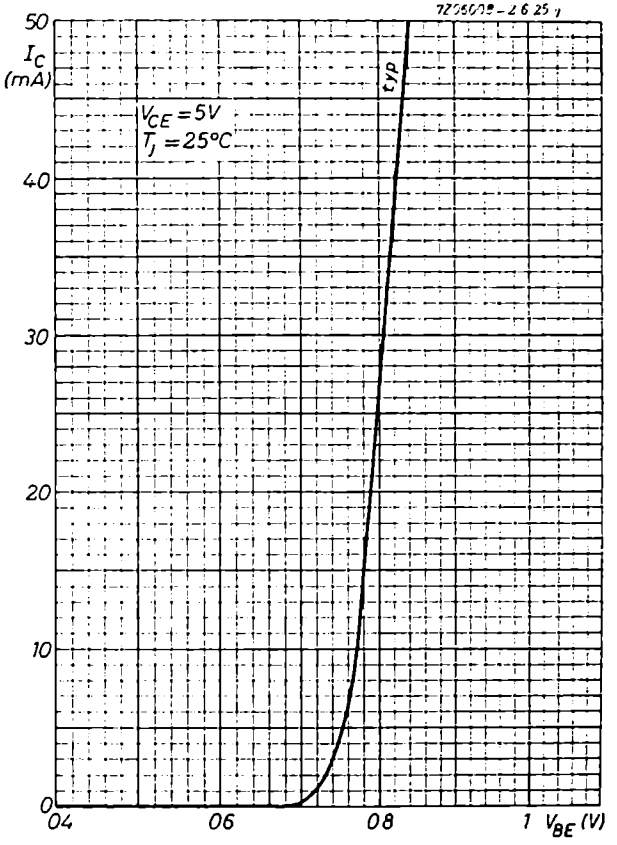
Maximum unilateralised power gain

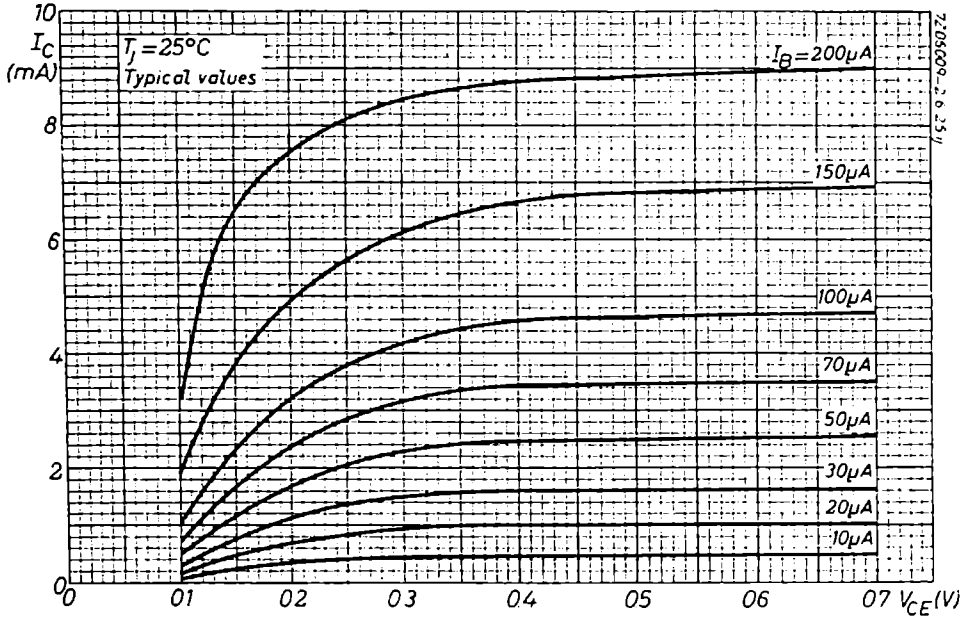
$$G_{UM} = \frac{|y_{fe}|^2}{4g_{ie}g_{oe}}$$

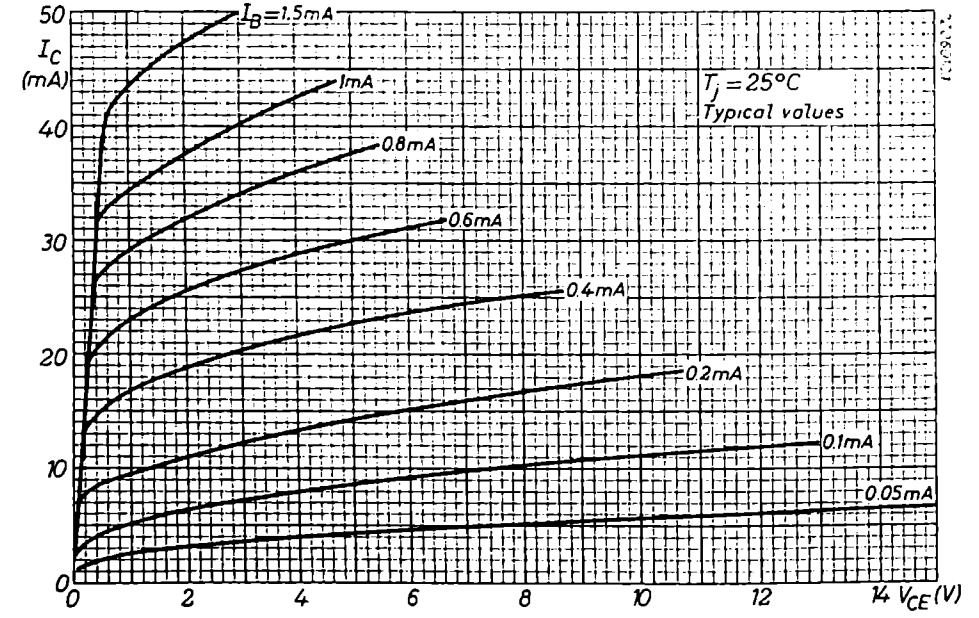
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz G_{UM} typ. 22 dB

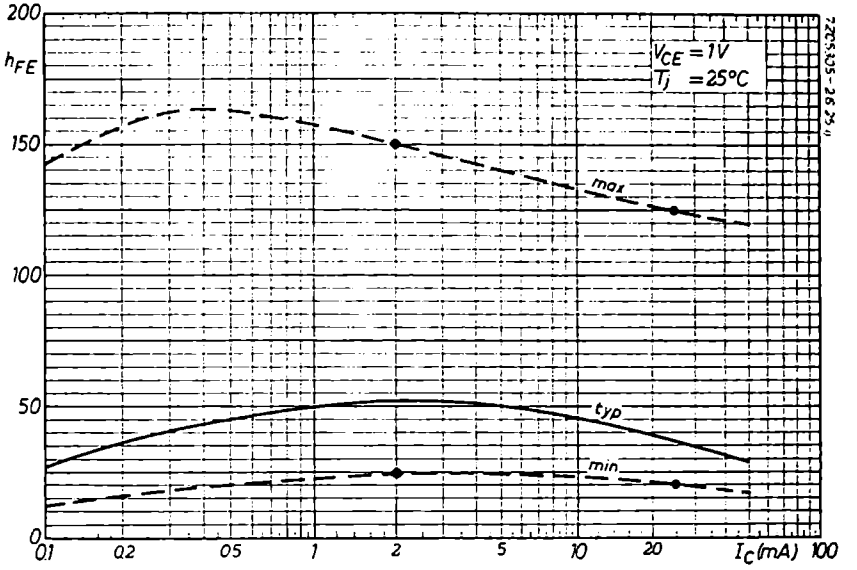
[1]) Shield lead grounded

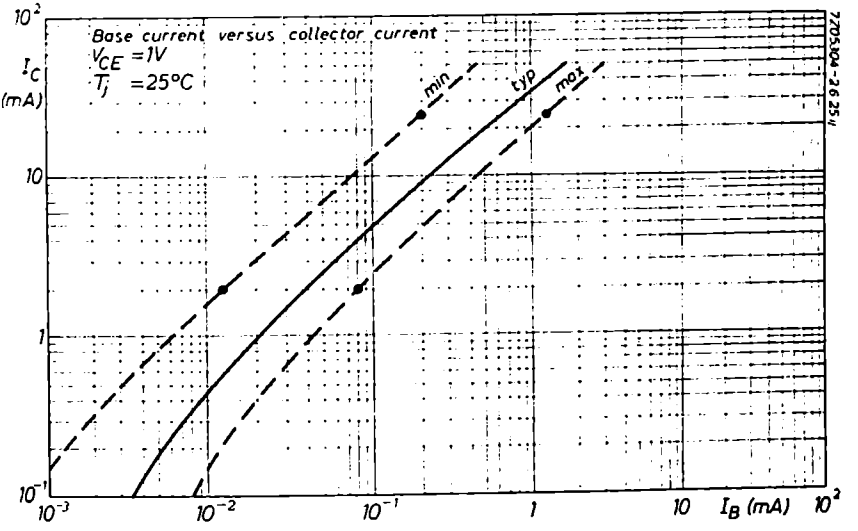

7205107-26.25 u
Typical values
I_{CBO} (nA)
10^3
10^2
10
1
10^{-1}
10^{-2}
10^{-3}
V_{CB} = 30V
15V
5V
0
50
100
150
T_j (°C)
200

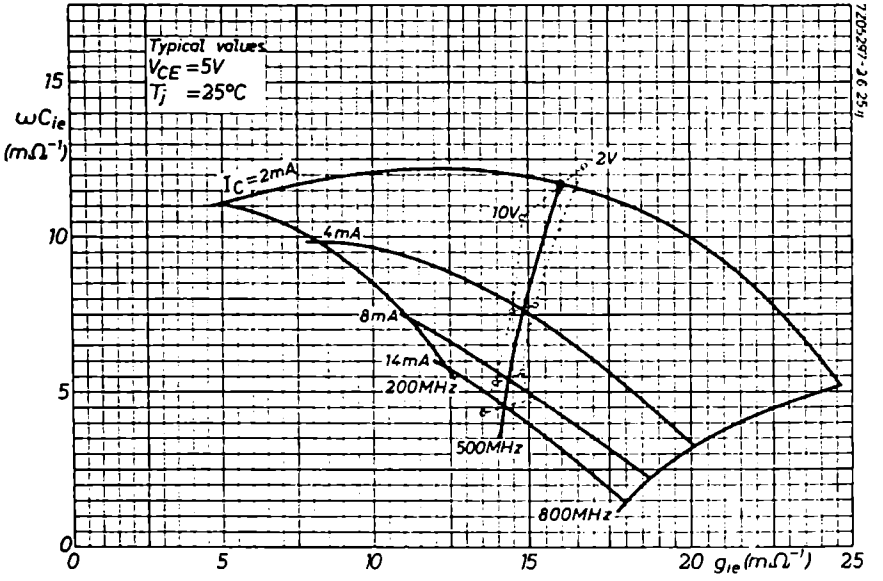

50
I_C
(mA)
40
30
20
10
0
$V_{CE}=5V$
$T_j=25°C$
typ
04
06
08
1
V_{BE} (V)

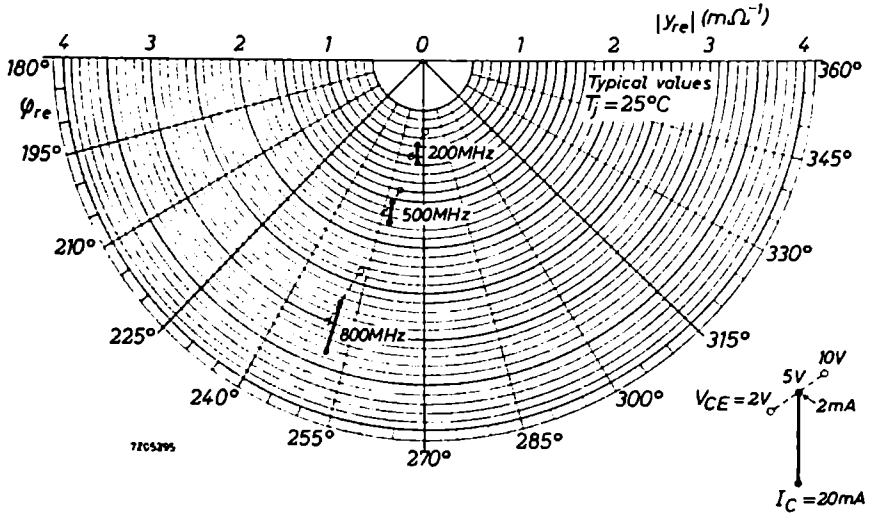

I_C (mA)
T_j = 25°C
Typical values
I_B = 200μA
150μA
100μA
70μA
50μA
30μA
20μA
10μA
V_{CE} (V)
0
01
02
03
04
05
06
07
2
4
6
8
10

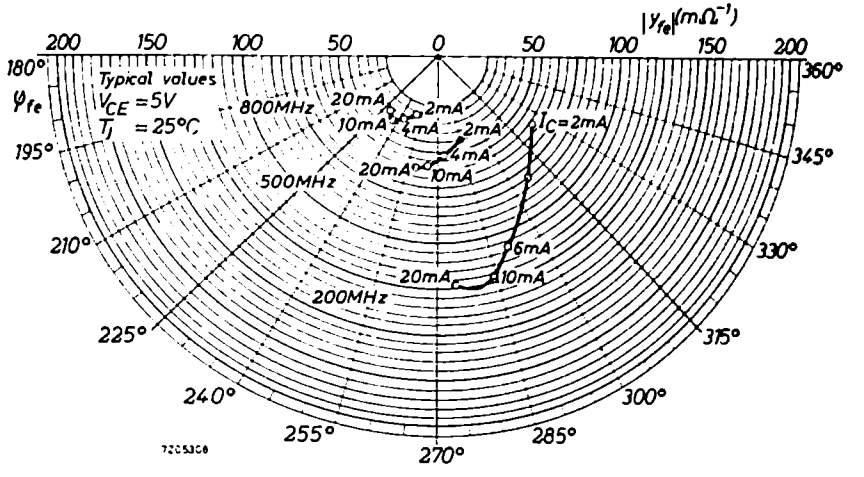

I_C (mA)
T_j = 25°C
Typical values
I_B = 1.5mA
1mA
0.8mA
0.6mA
0.4mA
0.2mA
0.1mA
0.05mA
V_{CE} (V)
0
2
4
6
8
10
12
14
10
20
30
40
50

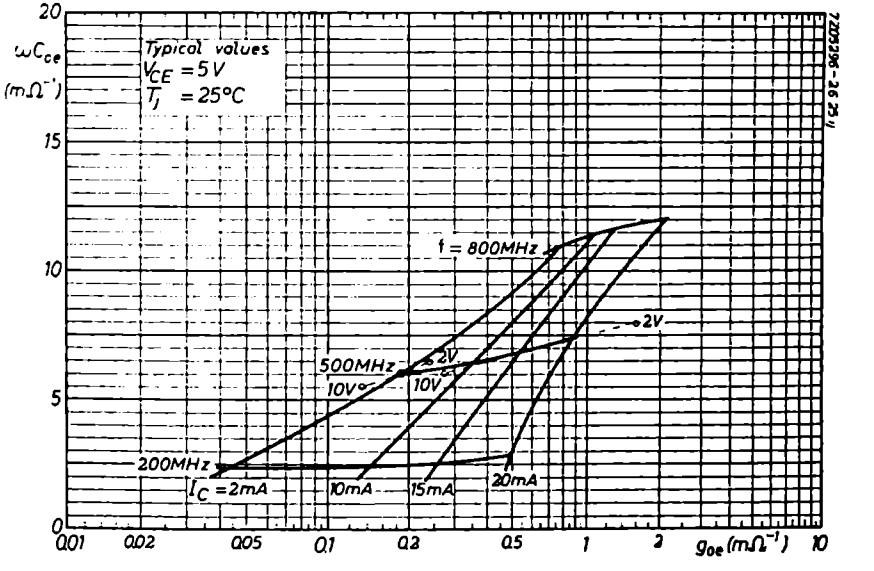

200
h_{FE}
150
100
50
0
0.1
0.2
0.5
1
2
5
10
20
I_C(mA)
100
V_{CE} = 1V
T_j = 25°C
max
typ
min
7Z95335-26.25

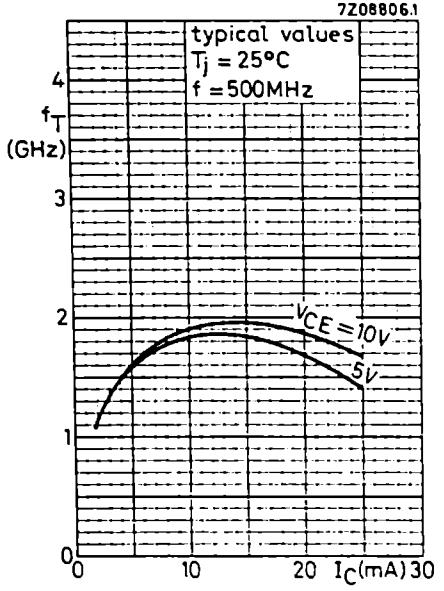

10^2
I_C
(mA)
10
1
10^{-1}
10^{-3}
10^{-2}
10^{-1}
1
10
I_B (mA)
10^2
Base current versus collector current
V_{CE} = 1V
T_j = 25°C
min
typ
max
7Z95004-26.25

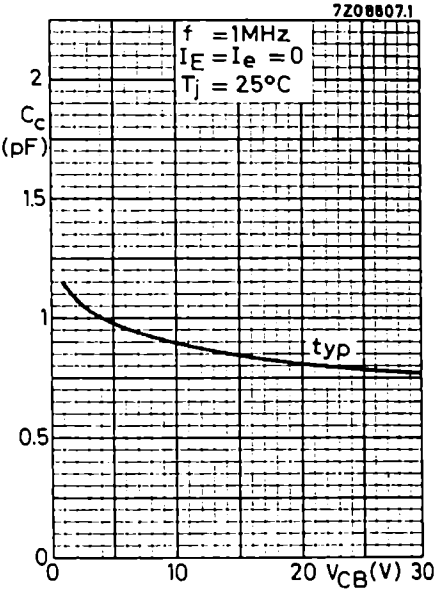

Typical values
V_{CE} = 5V
T_j = 25°C
ωC_{ie} (mΩ⁻¹)
g_{ie} (mΩ⁻¹)
I_C = 2mA
4mA
8mA
14mA
2V
10V
200MHz
500MHz
800MHz
0
5
10
15
20
25
7Z07267-3254

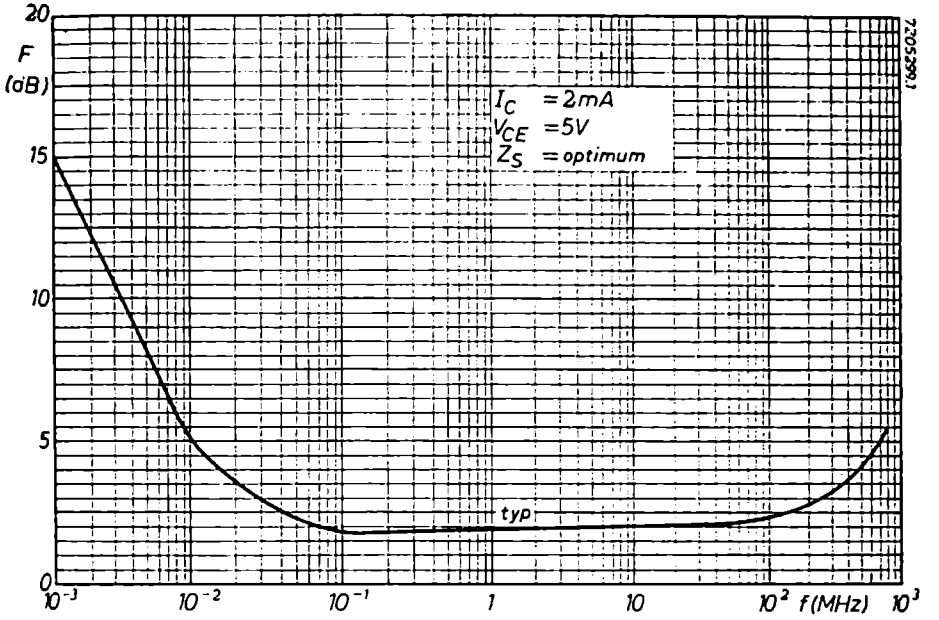

$|y_{re}|$ (mΩ⁻¹)
φ_{re}
Typical values
T_j = 25°C
200MHz
500MHz
800MHz
180°
195°
210°
225°
240°
255°
270°
285°
300°
315°
330°
345°
360°
V_{CE} = 2V
5V
10V
2mA
I_C = 20mA
7Z05395

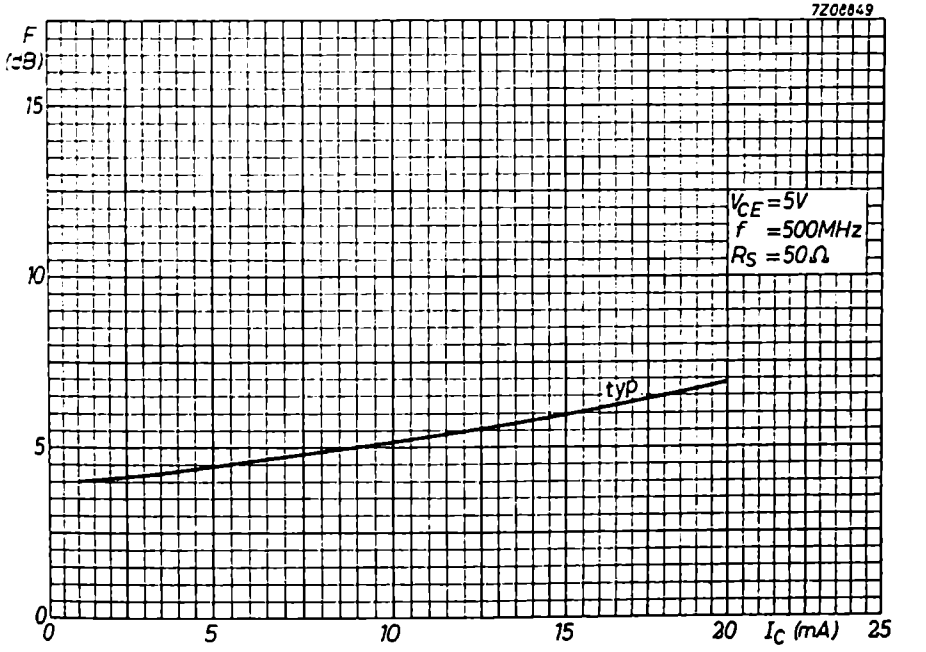

|Yfe| (mΩ⁻¹)
200
150
100
50
0
50
100
150
200
180°
360°
Typical values
VCE = 5V
Tj = 25°C
φfe
195°
345°
800MHz
20mA
10mA
2mA
1mA
2mA
IC=2mA
500MHz
20mA
10mA
4mA
210°
330°
6mA
20mA
10mA
200MHz
225°
315°
240°
300°
255°
285°
270°
7205306


20
ωCce
(mΩ⁻¹)
Typical values
VCE = 5V
Tj = 25°C
15
10
5
0
f = 800MHz
2V
500MHz
2V
10V
10V
200MHz
IC = 2mA
10mA
15mA
20mA
0.01
0.02
0.05
0.1
0.2
0.5
1
2
10
goe (mΩ⁻¹)
7205296-26.2.71


7Z08806.1
typical values
T_j = 25°C
f = 500MHz
f_T (GHz)
4
3
2
1
0
V_{CE} = 10V
5V
0
10
20
I_C(mA) 30


7Z08807.1
f = 1MHz
$I_E = I_e = 0$
T_j = 25°C
C_c (pF)
2
1.5
1
0.5
0
typ
0
10
20
V_{CB}(V) 30


F (dB)
20
15
10
5
0
10^{-3}
10^{-2}
10^{-1}
1
10
10^{2}
f (MHz)
10^{3}
I_C = 2mA
V_{CE} = 5V
Z_S = optimum
typ
7Z05991


F (dB)
15
10
5
0
0
5
10
15
20
25
I_C (mA)
V_{CE} = 5V
f = 500MHz
R_S = 50Ω
typ
7Z06849

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. The 2N918 is primarily intended for low power amplifiers and oscillators in the v.h.f. and u.h.f. ranges for industrial service.

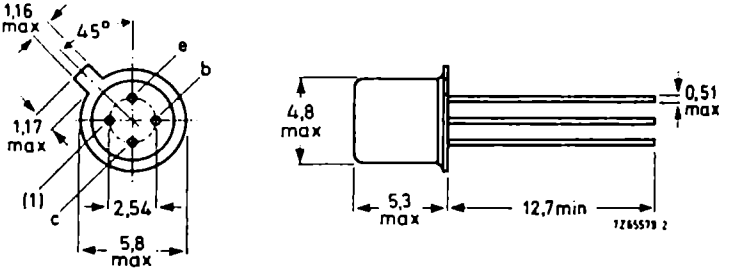
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	200	°C
Transition frequency I_C = 6 mA; V_{CE} = 10 V	f_T	>	900	MHz
Maximum unilateralized power gain I_C = 6 mA; V_{CE} = 12 V; f = 200 MHz	G_{UM}	typ.	36	dB
Noise figure at f = 60 MHz I_C = 1 mA; V_{CE} = 6 V; R_S = 400 Ω	F	<	6	dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (open base) I_C = 3 mA	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Currents				
Collector current (d.c.)	I_C	max.	50	mA
Power dissipation				
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	200	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0.88	°C/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0.58	°C/mW

CHARACTERISTICS $T_j = 25\ ^oC$ unless otherwise specified
All measurements taken with ungrounded shield lead

Collector cut-off current			
$I_E = 0$; $V_{CB} = 15$ V	I_{CBO}	< 10	nA
$I_E = 0$; $V_{CB} = 15$ V; $T_j = 150\ ^oC$	I_{CBO}	< 1	μA
Saturation voltages			
$I_C = 10$ mA; $I_B = 1$ mA	V_{CEsat}	< 0.4	V
	V_{BEsat}	< 1	V
D.C. current gain			
$I_C = 3$ mA; $V_{CE} = 1$ V	h_{FE}	> 20	
Collector capacitance at f = 140 kHz			
$I_E = I_e = 0$; $V_{CB} = 10$ V	C_c	< 1.7	pF
$I_E = I_e = 0$; $V_{CB} = 0$	C_c	< 3.0	pF
Emitter capacitance at f = 140 kHz			
$I_C = I_c = 0$; $V_{EB} = 0.5$ V	C_e	< 2.0	pF
Transition frequency			
$I_C = 6$ mA; $V_{CE} = 10$ V [1]	f_T	> 900	MHz
Noise figure at f = 60 MHz			
$I_C = 1$ mA; $V_{CE} = 6$ V; $R_S = 400\ \Omega$	F	< 6	dB
Oscillator power output at f = 500 MHz			
$-I_E = 8$ mA; $V_{CB} = 15$ V	P_o	> 30	mW
Maximum unilateralised power gain			
$G_{UM} = \dfrac{\lvert y_{fe}\rvert^2}{4 g_{ie} g_{oe}}$			
$I_C = 6$ mA; $V_{CE} = 12$ V; f = 200 MHz	G_{UM}	typ. 36	dB

[1] JEDEC registration: $I_C = 4$ mA; $V_{CE} = 10$ V, $f_T > 600$ MHz.

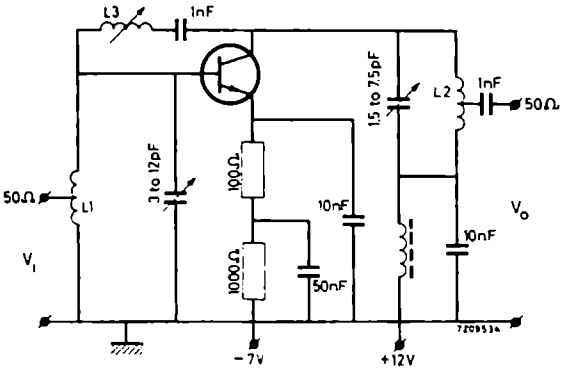
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Available power gain at f = 200 MHz

I_C = 6 mA G_p > 15 dB

Basic circuit for measuring the available neutralised power gain

Grounded shield lead



L1 = 3.5 turns tinned Cu wire, 1.3 mm
d = 8 mm; length = 11 mm

Tap at = 2 turns from earth side

L2 8 turns tinned Cu wire, 1.3 mm
d 3 mm; length = 22 mm

Tap at 1 turn from earth side

L3 = 0.4 to 0.65 μH

CATV AMPLIFIER MODULES (V.H.F.)

Selection guide
Accessory

CATV AMPLIFIER MODULES

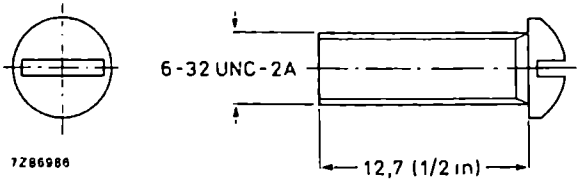
type number	frequency range MHz	power gain (dB) at f = 50 MHz	application	V_o (dBmV) at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)
BGY61	5 - 200	13,0 ± 0,5	reverse amplifiers	≥ 64
BGY65		18,5 ± 0,5		≥ 65
BGY67		22,5 ± 0,5		≥ 64
BGY50	40 - 300	12,5 ± 0,4	preamplifier	≥ 61
BGY51			post amplifier	≥ 63,5
BGY52	40 - 300	16,4 ± 0,4	preamplifier	≥ 61
BGY53			post amplifier	≥ 63,5
BGY54	40 - 300	17,0 ± 0,4	preamplifier	≥ 61
BGY55			post amplifier	≥ 63,5
BGY56	40 - 300	22,0 ± 0,6	preamplifier	≥ 61,5
BGY57			post amplifier	≥ 64
BGY58	40 - 300	33,0 ± 1,0	line extender	≥ 64
BGY58A	40 - 330	34,0 ± 1,0	line extender	≥ 64
BGY59	40 - 300	38,5 ± 1,0	line extender	≥ 64
BGY60	40 - 300	33,3 ± 1,0	interstage amplifier (2 x 17 dB)	≥ 64
BGY70	40 - 450	12,5 ± 0,4	preamplifier	≥ 62,5
BGY71			post amplifier	≥ 65
BGY74	40 - 450	17,0 ± 0,4	preamplifier	≥ 62,5
BGY75			post amplifier	≥ 65
BGY78	40 - 450	34,0 ± 1,0	line extender	≥ 62

All modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

ACCESSORY

ROUND HEAD SCREW 6-32 UNC-2A

Available, upon request, under type number 56396 or 12 NC code number 9390 298 10xx0.



The BGY53 is the replacement type for the BGY37.

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

			BGY50	BGY51	
Frequency range	f		40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		12,5 ± 0,4	12,5 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			+ 0,2 to + 0,8	+ 0,2 to + 0,8	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	0,2	0,2	dB
Return losses at input and output f = 40 MHz to 300 MHz		⩾	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	⩾	61	63,5	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	⩽	−68	−70	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	7	8	dB
D.C. supply voltage	$+V_B$	=	24	24	V *
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	−20 to + 90	°C

MECHANICAL DATA

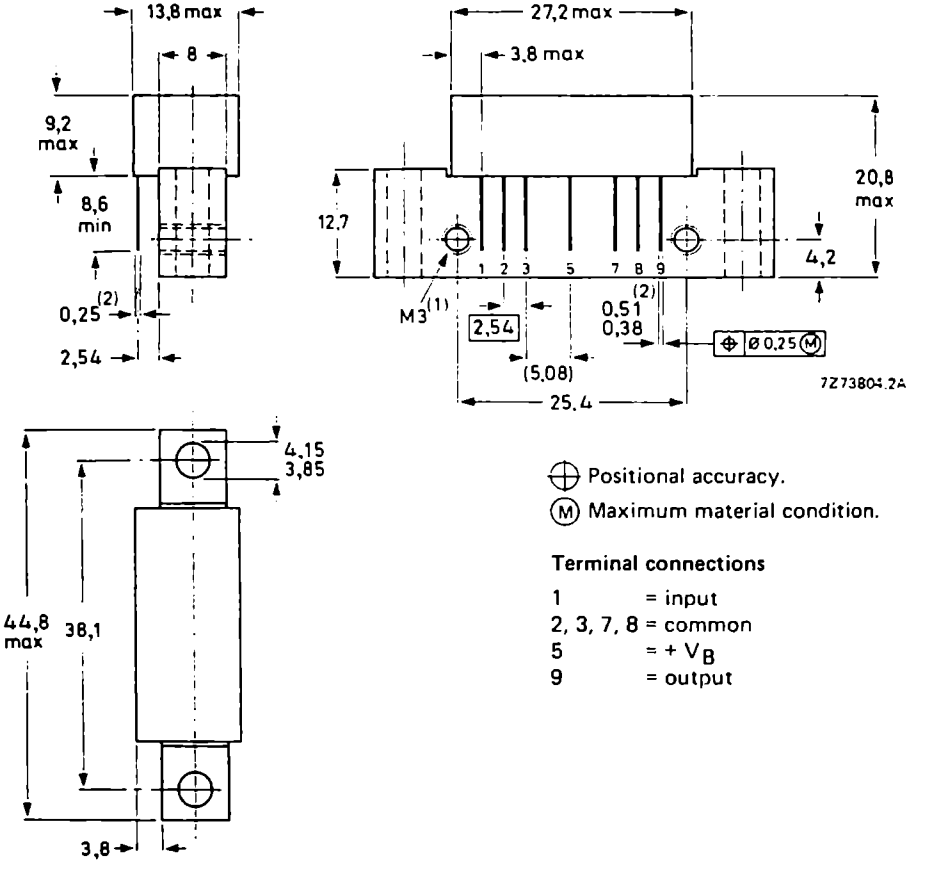
SOT-115 (see page 2).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum material condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}	−40 to +100	°C
Operating mounting base temperature	T_{mb}	−20 to +90	°C*

* With a heatsink ≤ 4,7 K/W for the BGY51, and ≤ 5,8 K/W for the BGY50 a maximum ambient temperature of + 65 °C is permissible. (K/W is SI unit for °C/W.)

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C			BGY50	BGY51	
Power gain at f = 50 MHz	G_p		12,5 ± 0,4	12,5 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			+0,2 to +0,8	+0,2 to +0,8	dB
Flatness of frequency response f = 40 MHz to 300 MHz		≤	0,2	0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		≥	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3; 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ -6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	≥	61	63,5	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	≤	−68	−70	dB
Noise figure f = 40 MHz to 300 MHz	F	≤	7	8	dB
Total d.c. current consumption	I_{tot}	typ. ≤	160 180	200 220	mA mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

			BGY52	BGY53	
Frequency range	f		40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		16,4 ± 0,4	16,4 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		≤	0,1	0,1	dB
Return losses at input and output f = 40 MHz to 300 MHz		≥	18	18	dB
Output voltage at d_{im} = −60 dB (D.I.N. 45004, par. 6.3: 3-tone)	V_o	≥	61	63,5	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	≤	−68	−70	dB
Noise figure f = 40 MHz to 300 MHz	F	≤	6	7	dB
D.C. supply voltage	$+ V_B$	=	24	24	V *
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	−20 to + 90	°C

MECHANICAL DATA

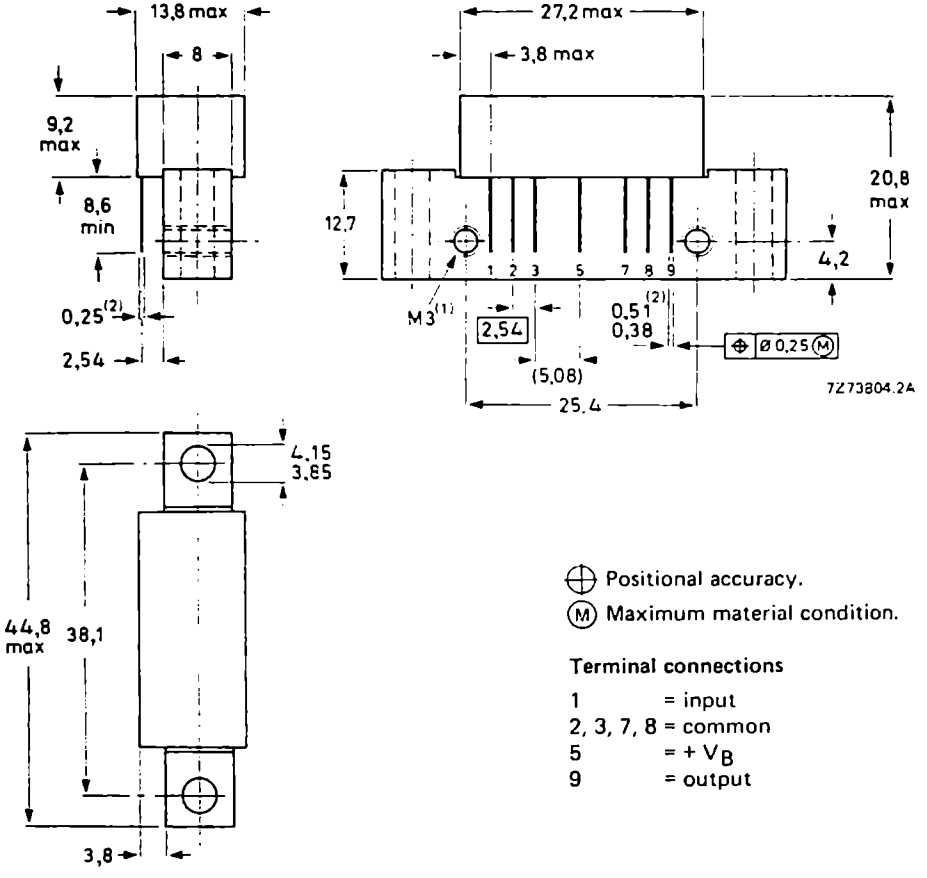
SOT-115 (see page 2).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum material condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C *

* With a heatsink ⩽ 4,7 K/W for the BGY53, and ⩽ 5,8 K/W for the BGY52 a maximum ambient temperature of + 65 °C is permissible. (K/W is SI unit for °C/W.)

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY52	BGY53	
Power gain at f = 50 MHz	G_p		16,4 ± 0,4	16,4 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	0,1	0,1	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	61	63,5	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−68	−70	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	7	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	160 180	200 220	mA mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 300 MHz.

BGY54: 17 dB input amplifier module;
BGY55: 17 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGY54	BGY55	
Frequency range	f		40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
Cable equivalent f = 40 MHz to 300 MHz			0 to 1,0	0 to 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		≤	± 0,1	± 0,1	dB
Return losses at input and output f = 40 MHz to 300 MHz		≥	20	20	dB
Output voltage at d_{im} = − 60 dB (IEC 45004, par. 6.3; 3-tone)	V_o	≥	61	63,5	dBmV
2nd order distortion at channel R V_o = 50 dBmV on channel 2 and 13	d_2	≤	−71	−73	dB
Composite triple beat 32 channels V_o = 46 dBmV		≤	−65	−67	dB
Output capability X_{mod} = −57 dB; 32 channels flat	V_o	≥	47,5	50	dBmV
Noise figure f = 40 MHz to 300 MHz	F	≤	6	6,5	dB
D.C. supply voltage	$+ V_B$	=	24	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	−20 to + 90	°C

MECHANICAL DATA

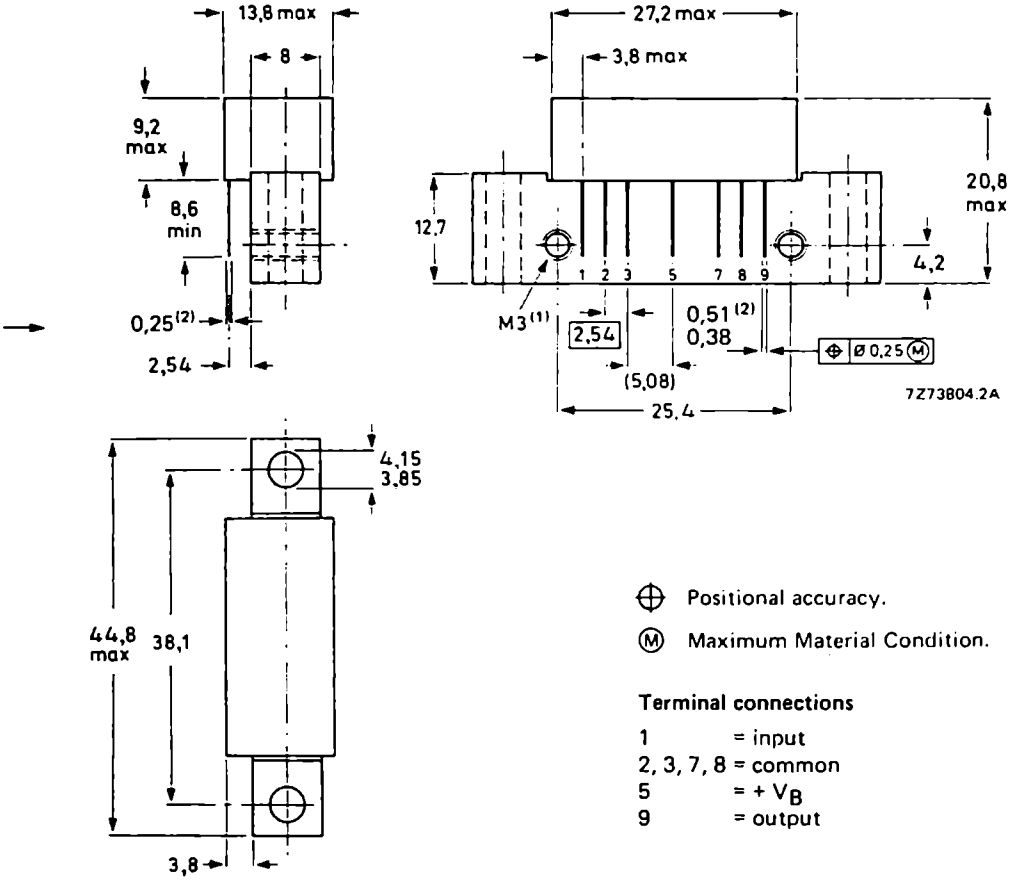
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

* With a heatsink ⩽ 4,7 K/W for the BGY55, and ⩽ 5,8 K/W for the BGY54 a maximum ambient temperature of + 65 °C is permissible. (K/W is SI unit for °C/W).

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY54	BGY55	
Power gain at f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to 1,0	0 to 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,1	± 0,1	dB
Return losses at input and output $Z_S = Z_L = 75\ \Omega$; f = 40 MHz to 300 MHz		⩾	20	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004, B; 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$−6 dB; f_q = 294,25 MHz $V_r = V_o$−6 dB; f_r = 296,25 MHz measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	61	63,5	dBmV
Second order distortion V_p = 50 dBmV; channel 2 V_q = 50 dBmV; channel 13 measured at channel R	d_2	⩽	−71	−73	dB
Composite triple beat 32 channels V_o = 46 dBmV; channel W		⩽	−65	−67	dB
Output capability on channel W d_{mod} = −57 dB; 32 channels flat	V_o	⩾	47,5	50	dBmV
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	6,5	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	160 180	200 220	mA mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

			BGY56	BGY57	
Frequency range	f		40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		22,0 ± 0,6	22,0 ± 0,6	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		≤	± 0,2	± 0,2	dB
Return losses at input and output f = 40 MHz to 300 MHz		≥	20	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	≥	61,5	64	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	≤	−64	−66	dB
Noise figure f = 40 MHz to 300 MHz	F	≤	6	7	dB
D.C. supply voltage	$+V_B$	=	24	24	V *
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	−20 to + 90	°C

MECHANICAL DATA

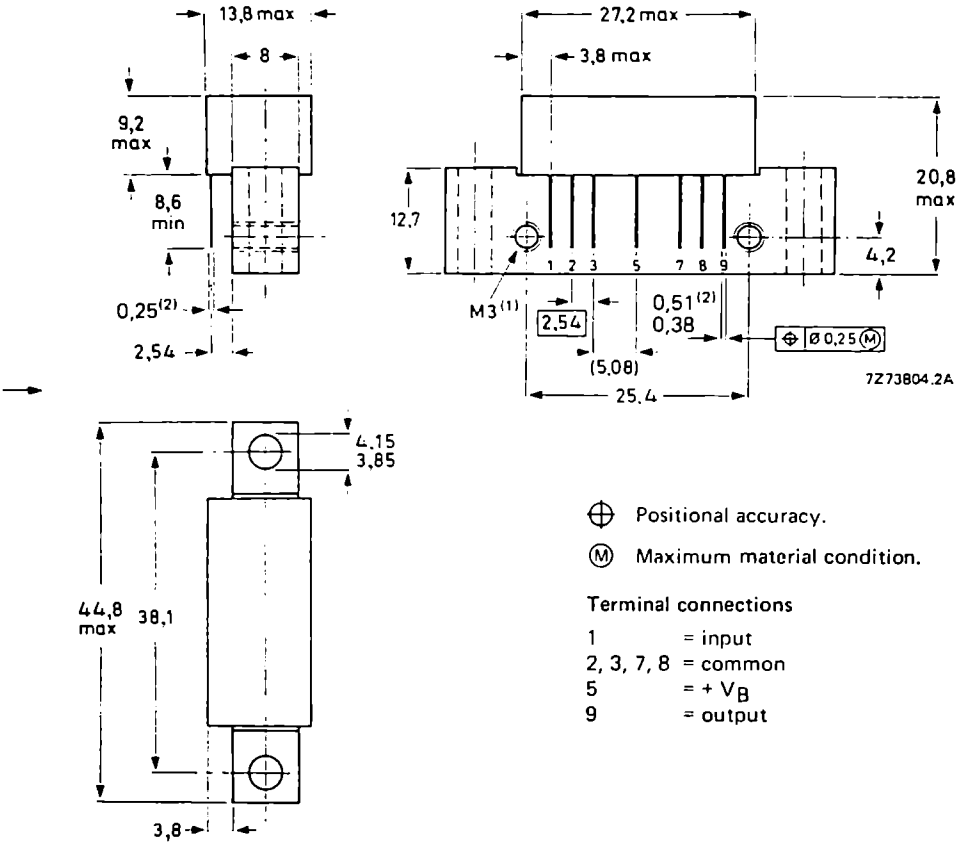
SOT-115 (see page 2).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum material condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	63 dBmV
Storage temperature	T_{stg}	−40 to +100	°C
Operating mounting base temperature	T_{mb}	−20 to +90	°C *

* With a heatsink ⩽ 4,7 K/W for the BGY57, and ⩽ 5,8 K/W for the BGY56 a maximum ambient temperature of + 65 °C is permissible. (K/W is SI unit for °C/W.)

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY56	BGY57	
Power gain at f = 50 MHz	G_p		22,0 ± 0,6	22,0 ± 0,6	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,2	± 0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾	20	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004 par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	61,5	64	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−64	−66	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	7	dB
Total d.c. current consumption	I_{tot}	typ.	160	200	mA
		⩽	180	220	mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Hybrid amplifier module intended for CATV systems.

QUICK REFERENCE DATA

Frequency range	f		40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	Ω
Power gain at f = 50 MHz	G_p		33,0 ± 1,0	dB
Slope cable equivalent f = 40 MHz to 300 MHz			+ 0,5 to + 1,5	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,3	dB
Return losses at input and output f = 40 MHz to 300 MHz		⩾	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	⩾	64	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	⩽	−68	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	dB
D.C. supply voltage	$+V_B$	=	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	320	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	°C

MECHANICAL DATA

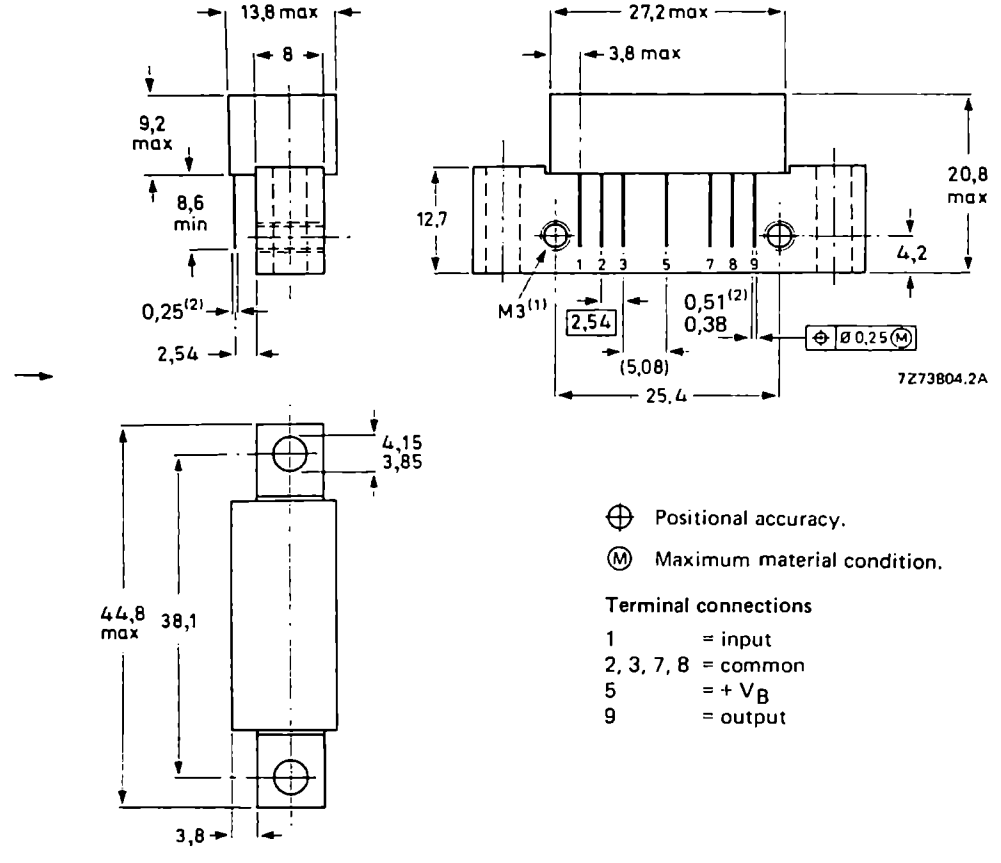
SOT-115 (see page 2).

* The module is able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum material condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	55 dBmV
Storage temperature	T_{stg}		−40 to + 100 °C
Operating mounting base temperature	T_{mb}		−20 to +90 °C *

* With a heatsink ⩽ 3,2 K/W (K/W is SI unit for °C/W) a maximum ambient temperature of + 65 °C is permissible.

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p		33,0 ± 1,0 dB
Slope cable equivalent f = 40 MHz to 300 MHz			+ 0,5 to + 1,5 dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,3 dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾	20 dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	64 dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−68 dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6 dB
Total d.c. current consumption	I_{tot}	typ. ⩽	320 mA 340 mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use as 34 dB line extender in CATV systems operating at frequencies up to 330 MHz.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

Frequency range	f	40 to 330	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	Ω
Power gain at f = 50 MHz	G_p	34,0 ± 1,0	dB
Slope cable equivalent f = 40 MHz to 330 MHz		0,5 to 1,5	dB
Flatness of frequency response f = 40 MHz to 330 MHz		≤ ± 0,3	dB
Return losses at input and output f = 40 MHz to 330 MHz		≥ 20	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	≥ 64	dBmV
2nd order distortion at channel R V_o = 50 dBmV on channel 2 and 13	d_2	≤ −70	dB
Composite triple beat 32 channels V_o = 46 dBmV		≤ −67	dB
Output capability X_{mod} = −57 dB; 32 channels flat	V_o	≥ 50	dBmV
Noise figure f = 40 MHz to 330 MHz	F	≤ 6	dB
D.C. supply voltage	$+V_B$	= 24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ. 320	mA
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

MECHANICAL DATA

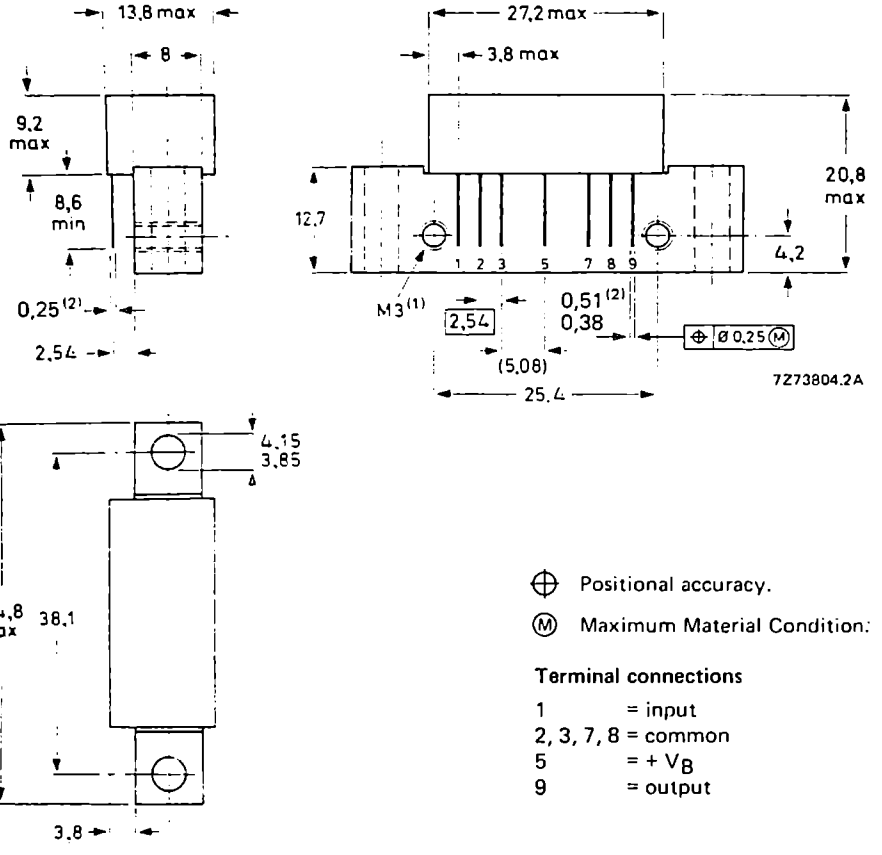
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	55 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

* With a heatsink ≤ 3,2 K/W (K/W is SI unit for °C/W) a maximum ambient temperature of + 65 °C is permissible.

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p		34,0 ± 1,0 dB
Slope cable equivalent f = 40 MHz to 330 MHz			0,5 to 1,5 dB
Flatness of frequency response f = 40 MHz to 330 MHz		≤	± 0,3 dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 330 MHz		≥	20 dB
Output voltage at d_{im} = −60 dB (DIN 45004, 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	≥	64 dBmV
2nd order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R	d_2	≤	−70 dB
Composite triple beat 32 channels V_o = 46 dBmV; channel W		≤	−67 dB
Composite triple beat 40 channels V_o = 46 dBmV; channel W		≤	−63 dB
Output capability on channel W X_{mod} = −57 dB; 32 channels flat	V_o	≥	50 dBmV
X_{mod} = −57 dB; 40 channels flat	V_o	≥	49,5 dBmV
Noise figure f = 40 MHz to 330 MHz	F	≤	6 dB
Total d.c. current consumption	I_{tot}	typ. ≤	320 mA 340 mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Hybrid amplifier module intended for CATV systems up to 300 MHz.

QUICK REFERENCE DATA

Frequency range	f		40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	Ω
Power gain at f = 50 MHz	G_p		38,5 ±1,0	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to +1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		≤	±0,3	dB
Return losses at input and output f = 40 MHz to 300 MHz		≥	18	dB
Output voltage at d_{im} = −60 dB (DIN45004B, par. 6,3: 3-tone)	V_o	≥	64	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	≤	−68	dB
Noise figure f = 40 MHz to 300 MHz	F	≤	6	dB
D.C. supply voltage	$+V_B$	=	24	V*
Total d.c. current consumption at V_B = +24 V	I_{tot}	typ.	320	mA
Operating mounting base temperature	T_{mb}		−20 to +90	°C

MECHANICAL DATA

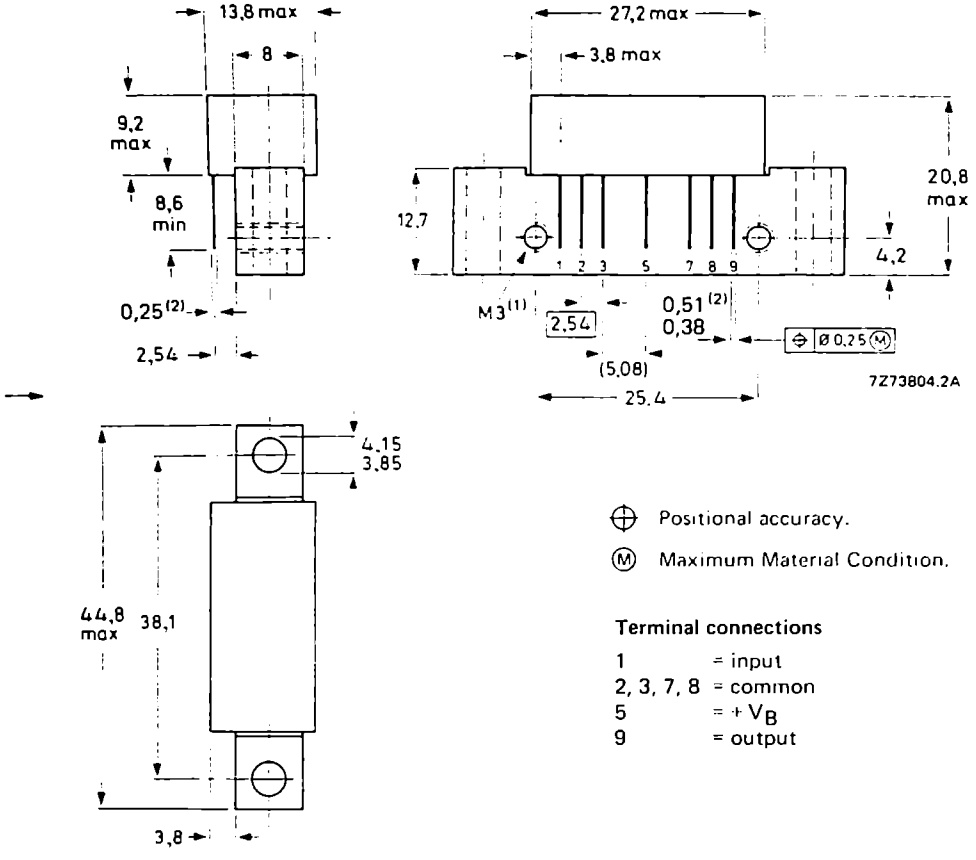
SOT-115 (see page 2).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	53 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

* With a heatsink ⩽ 3,2 K/W (K/W is SI unit for °C/W) a maximum ambient temperature of + 65 °C is permissible.

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p	38,5 ± 1,0	dB
Slope cable equivalent f = 40 MHz to 300 MHz		0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽ ± 0,3	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾ 18	dB
Output voltage at d_{im} = −60 dB (DIN45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾ 64	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽ −68	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽ 6	dB
Total d.c. current consumption	I_{tot}	typ. 320 ⩽ 340	mA mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Interstage hybrid amplifier module intended for CATV systems up to 300 MHz. The inputs and outputs of the stages have been terminated separately.

QUICK REFERENCE DATA for total amplifier unless otherwise specified

Frequency range	f		40 to 300		MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75		Ω
Power gain at f = 50 MHz	G_p		33,3 ± 1,0		dB
Slope cable equivalent f = 40 MHz to 300 MHz			+ 0,5 to + 1,5		dB
Flatness of frequency response f = 40 MHz to 300 MHz		≤	± 0,3		dB
			pre-stage	final stage	
Return losses at input and output f = 40 MHz to 300 MHz	s_{11}	≥	20	18	dB
	s_{22}	≥	18	20	dB
Output voltage at d_{im} = −60 dB (DIN45004B, par. 6.3: 3-tone)	V_o	≥	64		dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	≤	−66		dB
Noise figure f = 40 MHz to 300 MHz	F	≤	6		dB
D.C. supply voltage	$+V_B$	=	24		V*
Total d.c. current consumption at V_B = +24 V	I_{tot}	typ.	320		mA
Operating mounting base temperature	T_{mb}		−20 to +90		°C

MECHANICAL DATA

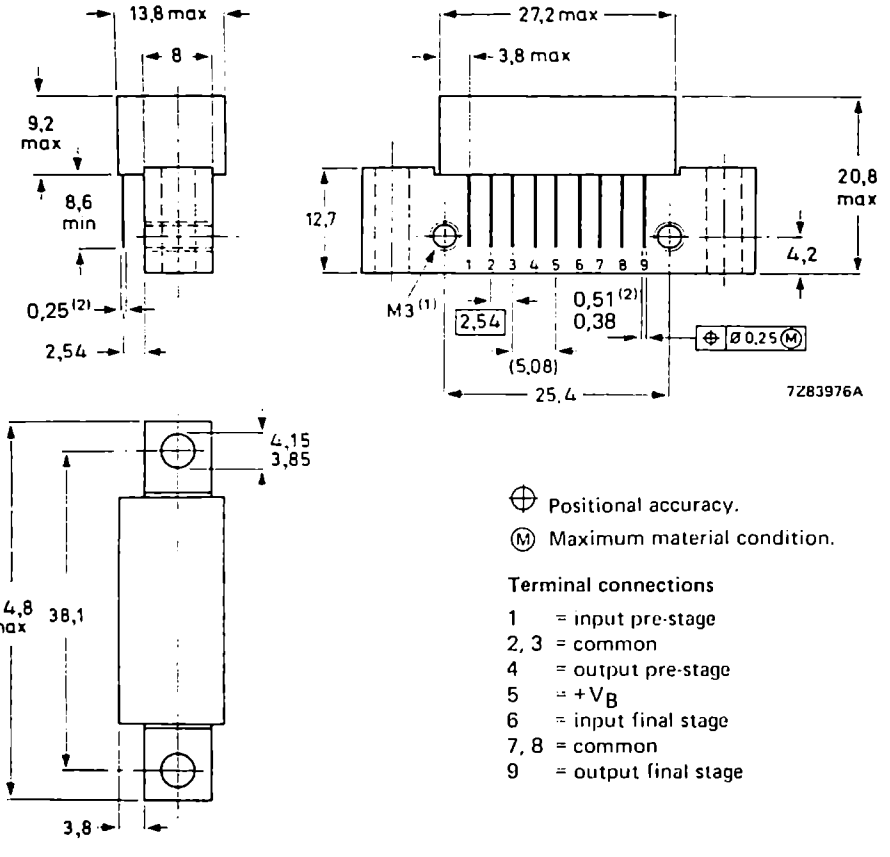
SOT-115 (see page 2).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum material condition.

Terminal connections

1 = input pre-stage
2, 3 = common
4 = output pre-stage
5 = $+V_B$
6 = input final stage
7, 8 = common
9 = output final stage

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage total amplifier	V_i	max.	55 dB/mV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to +90	°C*

* With a heatsink ⩽ 3,2 K/W (K/W is SI unit for °C/W) a maximum ambient temperature of + 65 °C is permissible.

CHARACTERISTICS for total amplifier unless otherwise specified.

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p		33,3 ± 1,0		dB
Slope cable equivalent f = 40 MHz to 300 MHz			+ 0,5 to + 1,5		dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,3		dB
			pre-stage	final stage	
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz	s_{11}	⩾	20	18	dB
	s_{22}	⩾	18	20	dB
Output voltage at d_{im} = −60 dB (DIN45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz; $V_q = V_o$ −6 dB; f_q = 294,25 MHz; $V_r = V_o$ −6 dB; f_r = 296,25 MHz; Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	64		dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz; $V_q = V_o$ = 50 dBmV; f_q = 144 MHz; Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−66		dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6		dB
Total d.c. current consumption	I_{tot}	typ.	320		mA
		⩽	340		mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz. This device is intended as a reverse amplifier for use in two-way systems.

QUIKC REFERENCE DATA

Frequency range	f	5 to 200	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	Ω
Power gain at f = 50 MHz	G_p	13,0 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,5 to + 0,2	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	< ± 0,25	dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	> 18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	64	dBmV
2nd-order distortion V_o = 50 dBmV	d_2	< −72	dB
Composite triple beat; 25 channels V_o = 50 dBmV	CTB	typ. −64	dB
Noise figure f = 200 MHz	F	typ. 7,0	dB
D.C. supply voltage	$\pm V_B$	= 24	V*
Total d.c. current consumption V_B = + 24 V	I_{tot}	typ. 200	mA
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

MECHANICAL DATA

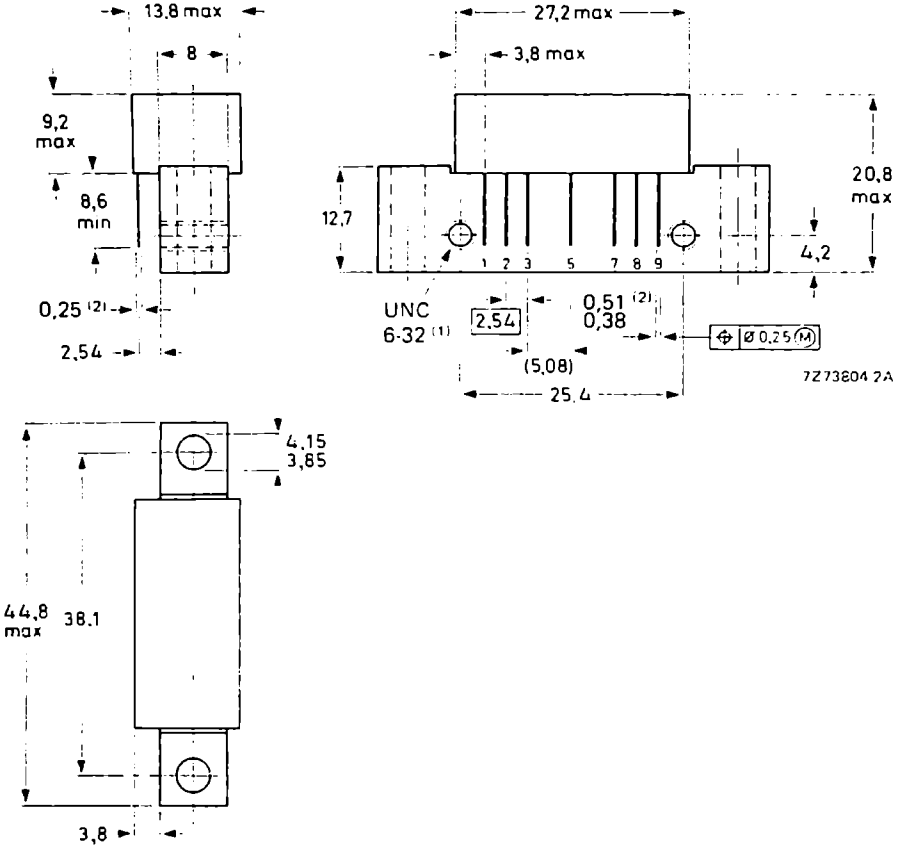
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see 'Accessory').
(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

* With a heatsink $\leq$ 4,7 K/W (K/W is SI unit for °C/W) a maximum ambient temperature of + 65 °C is permissible.

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p		13,0 ± 0,5 dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L		−0,5 to + 0,2 dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽	± 0,25 dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	S_{11-22}	⩾	18 dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	⩾	64 dBmV
2nd-order distortion V_o = 50 dBmV; f_p = 66 MHz V_o = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−72 dB
Composite triple beat on 25 channels V_o = 50 dBmV, measured on channel 11	CTB	typ.	−64 dB
Noise figure f = 200 MHz	F	typ.	7,0 dB
Total d.c. current consumption	I_{tot}	typ. ⩽	200 mA 230 mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at freqiencies from 5 MHz to 200 MHz. This device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5 to 200	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	Ω
Power gain at f = 50 MHz	G_p	18,5 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,5 to +0,2	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽ ± 0,25	dB
Return losses at input and output f = 5 MHz to 200 MHz	$S_{11\text{-}22}$	⩾ 18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾ 65	dBmV
2nd-order distortion V_o = 50 dBmV	d_2	⩽ −72	dB
Composite triple beat; 25 channels V_o = 50 dBmV	CTB	typ. −64	dB
Noise figure f = 200 MHz	F	typ. 6,0	dB
D.C. supply voltage	$+V_B$	= 24	V*
Total d.c. current consumption V_B = + 24 V	I_{tot}	typ. 200	mA
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

MECHANICAL DATA

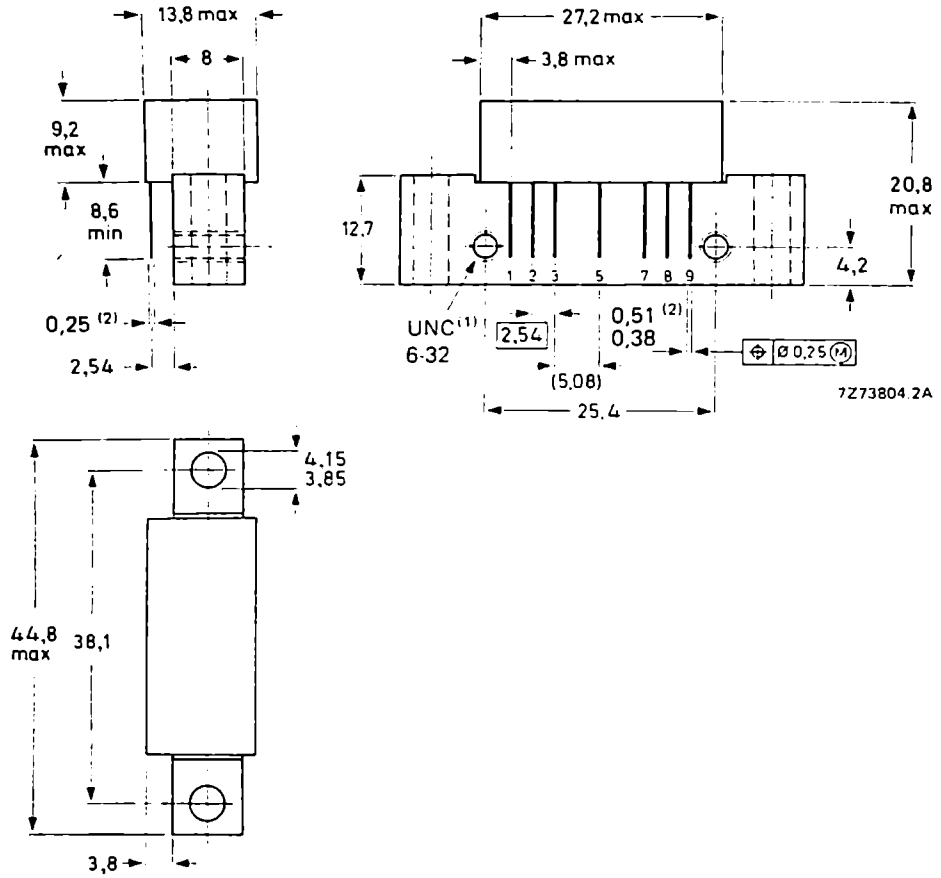
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see 'Accessory').
(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

* With a heatsink ≤ 4,7 K/W (K/W is SI unit for °C/W) a maximum ambient temperature of + 65 °C is permissible.

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p		18,5 ± 0,5 dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L		−0,5 to + 0,2 dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	≤	± 0,25 dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	S_{11-22}	≥	18 dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	≥	65 dBmV
2nd-order distortion V_o = 50 dBmV; f_p = 66 MHz V_o = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	≤	−72 dB
Composite triple beat on 25 channels V_o = 50 dBmV; measured on channel 11	CTB	typ.	−64 dB
Noise figure f = 200 MHz	F	typ.	6,0 dB
Total d.c. current consumption	I_{tot}	typ. ≤	200 mA 230 mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz. This device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5	to 200	MHz
Source impedance and load impedance	$Z_S = Z_L$		75	Ω
Power gain at f = 50 MHz	G_p	22,5	± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,5	to +0,2	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽	±0,25	dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	⩾	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾	64	dBmV
2nd-order distortion V_o = 50 dBmV	d_2	⩽	−72	dB
Composite triple beat; 25 channels V_o = 50 dBmV	CTB	typ.	−63	dB
Noise figure f = 200 MHz	F	typ.	5,0	dB
D.C. supply voltage	$+V_B$	=	24	V*
Total d.c. current consumption V_B = +24 V	I_{tot}	typ.	200	mA
Operating mounting base temperature	T_{mb}	−20	to +90	°C

MECHANICAL DATA

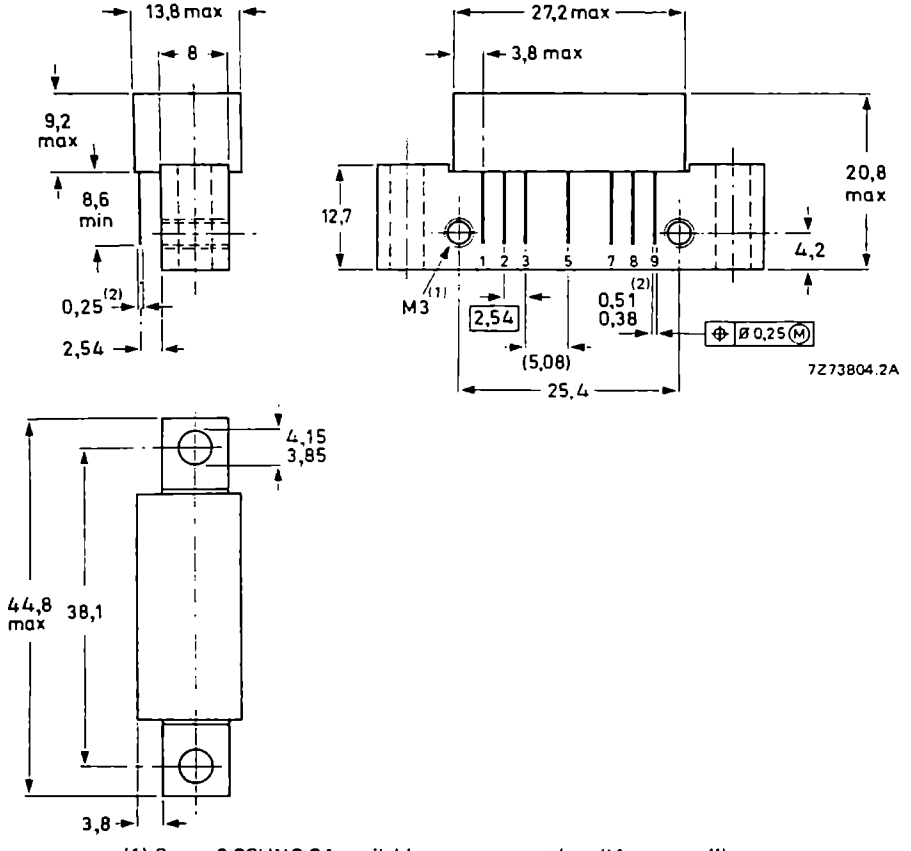
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessory").
(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	63 dBmV
Storage temperature	T_{stg}	−40 to +100	°C
Operating mounting base temperature	T_{mb}	−20 to +90	°C*

* With a heatsink ⩽ 4,7 K/W (K/W is SI unit for °C/W) a maximum ambient temperature of +65 °C is permissible.

CHARACTERISTICS

Supply voltage V_B = +24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p	22,5 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,5 to +0,2	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	≤ ± 0,25	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	S_{11-22}	≥ 18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ − 6 dB; f_q = 194,25 MHz $V_r = V_o$ − 6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	≥ 64	dBmV
2nd-order distortion V_o = 50 dBmV; f_p = 66 MHz V_o = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	≤ −72	dB
Composite triple beat on 25 channels V_o = 50 dBmV; measured on channel 11	CTB	typ. −63	dB
Noise figure f = 200 MHz	F	typ. 5,0	dB
Total d.c. current consumption	I_{tot}	typ. 200 ≤ 230	mA mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY70: 12,5 dB input amplifier module;
BGY71: 12,5 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGY70	BGY71	
Frequency range	f		40 to 450	40 to 450	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		12,5 ± 0,4	12,5 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz			0,5 to 2	0,5 to 2	dB
Flatness of frequency response f = 40 MHz to 450 MHz		≤	± 0,2	± 0,2	dB
Return losses at input and output f = 40 MHz to 450 MHz		≥	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	≥	62,5	65	dBmV ←
2nd order distortion at channel R V_o = 50 dBmV on channel 2 and 13	d_2	≤	−71	−73	dB
Composite triple beat 52 channels V_o = 46 dBmV		≤	−55	−59	dB
Output capability X_{mod} = −57 dB; 52 channels flat	V_o	≥	46,5	49,5	dBmV
Noise figure f = 40 MHz to 450 MHz	F	≤	7,5	8,5	dB
D.C. supply voltage	$+V_B$	=	24	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	−20 to + 90	°C

MECHANICAL DATA

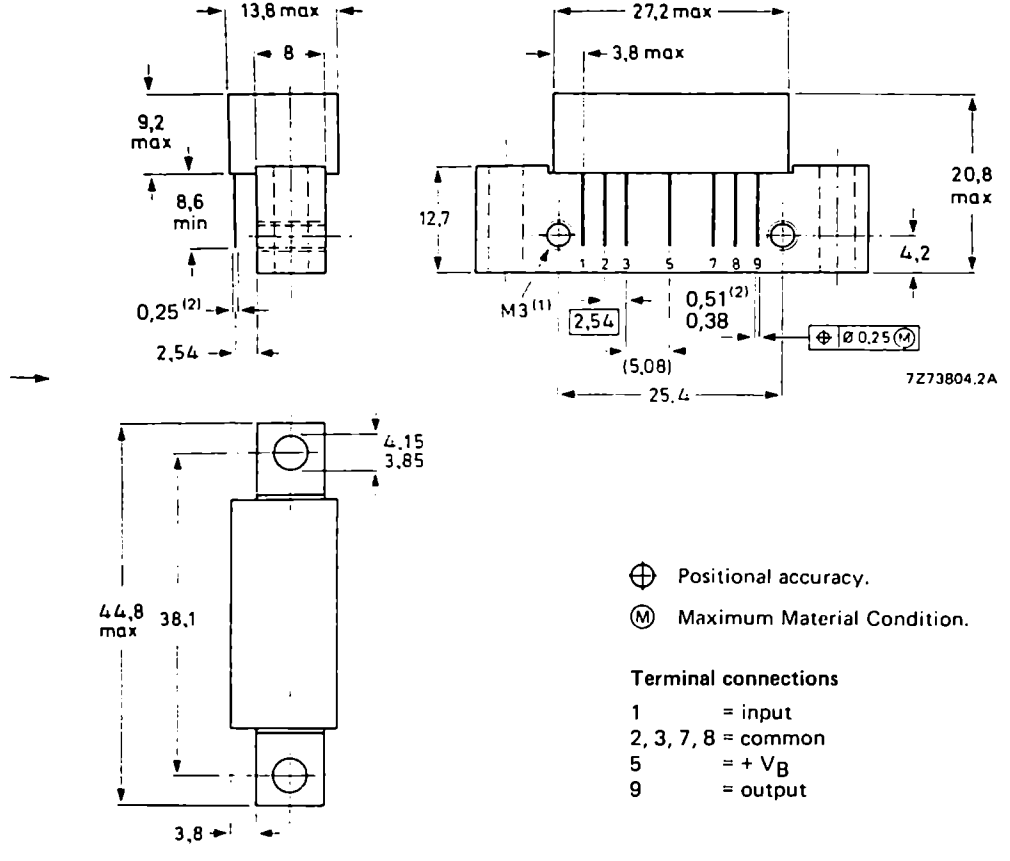
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

* With a heatsink ≤ 4,7 K/W for the BGY71, and ≤ 5,8 K/W for the BGY70 a maximum ambient temperature of + 65 °C is permissible. (K/W is SI unit for °C/W).

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY70	BGY71	
Power gain at f = 50 MHz	G_p		12,5 ± 0,4	12,5 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz			0,5 to 2	0,5 to 2	dB
Flatness of frequency response f = 40 MHz to 450 MHz		≤	± 0,2	± 0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 450 MHz		≥	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; f_p = 387,25 MHz $V_q = V_o$ −6 dB; f_q = 394,25 MHz $V_r = V_o$ −6 dB; f_r = 396,25 MHz Measured at $f_{(p+q-r)}$ = 385,25 MHz	V_o	≥	61	63,5	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	≥	62,5	65	dBmV
2nd order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R	d_2	≤	−71	−73	dB
V_o = 50 dBmV; channel G V_o = 50 dBmV; channel N Measured at channel H 14	d_2	typ.	−68	−70	dB
Composite triple beat 52 channels V_o = 46 dBmV; channel H 14		≤	−55	−59	dB
Output capability on channel H 14 X_{mod} = −57 dB; 52 channels flat	V_o	≥	46,5	49,5	dBmV
Noise figure f = 40 MHz to 450 MHz	F	≤	7,5	8,5	dB
Total d.c. current consumption	I_{tot}	typ. ≤	160 180	200 220	mA mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY74: 17 dB input amplifier module;
BGY75: 17 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGY74	BGY75	
Frequency range	f		40 to 450	40 to 450	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz			0,5 to 1,5	0,5 to 1,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz		≤	± 0,1	± 0,1	dB
Return losses at input and output f = 40 MHz to 450 MHz		≥	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	≥	62,5	65	dBmV ←
2nd order distortion at channel R V_o = 50 dBmV on channel 2 and 13	d_2	≤	−71	−73	dB
Composite triple beat 52 channels V_o = 46 dBmV		≤	−56	−60	dB
Output capability X_{mod} = −57 dB; 52 channels flat	V_o	≥	46,5	49,5	dBmV
Noise figure f = 40 MHz to 450 MHz	F	≤	7	7,5	dB
D.C. supply voltage	$+V_B$	=	24	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	−20 to + 90	°C

MECHANICAL DATA

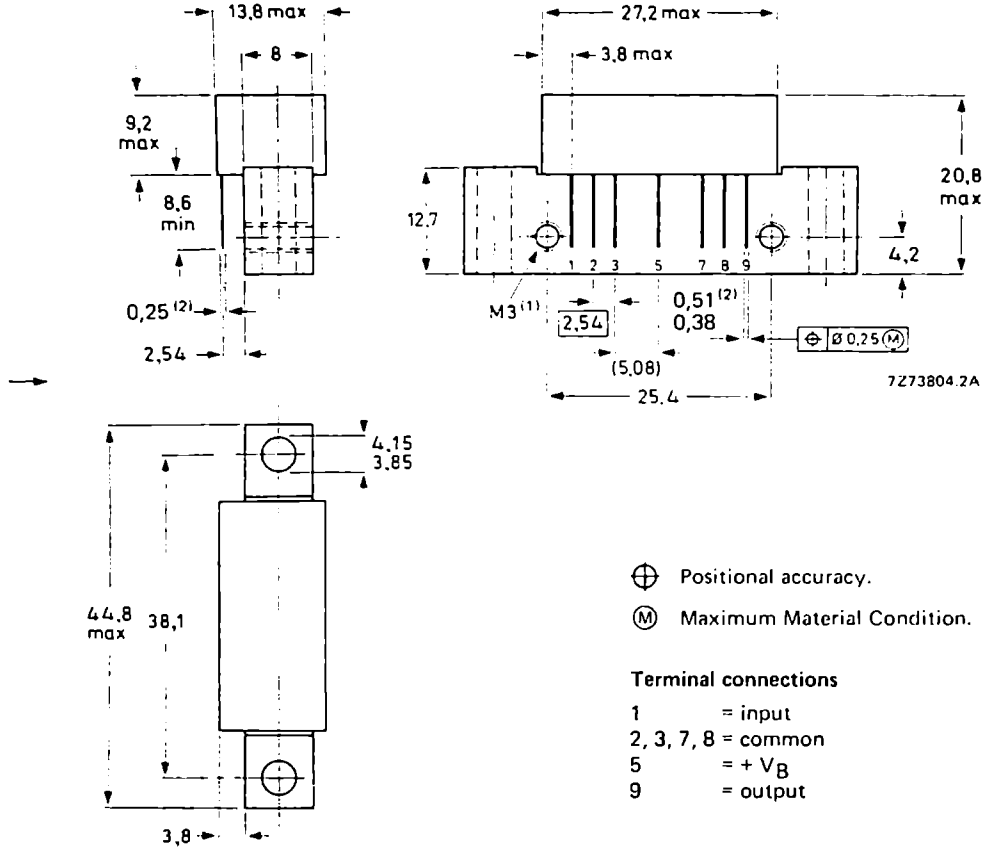
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see Accessory).

(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

* With a heatsink ≤ 4,7 K/W for the BGY75, and ≤ 5,8 K/W for the BGY74 a maximum ambient temperature of + 65 °C is permissible. (K/W is SI unit for °C/W).

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY74	BGY75	
Power gain at f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz			0,5 to 1,5	0,5 to 1,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz		≤	± 0,1	± 0,1	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 450 MHz		≥	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; f_p = 387,25 MHz $V_q = V_o$ −6 dB; f_q = 394,25 MHz $V_r = V_o$ −6 dB; f_r = 396,25 MHz Measured at $f_{(p+q-r)}$ = 385,25 MHz	V_o	≥	61	63,5	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	≥	62,5	65	dBmV
2nd order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R	d_2	≤	−71	−73	dB
V_o = 50 dBmV; channel G V_o = 50 dBmV; channel N Measured at channel H 14	d_2	typ.	−68	−70	dB
Composite triple beat 52 channels V_o = 46 dBmV; channel H 14		≤	−56	−60	dB
Output capability on channel H 14 X_{mod} = −57 dB; 52 channels flat	V_o	≥	46,5	49,5	dBmV
Noise figure f = 40 MHz to 450 MHz	F	≤	7	7,5	dB
Total d.c. current consumption	I_{tot}	typ. ≤	160 180	200 220	mA mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use as 34 dB line extender in CATV systems operating at frequencies up to 450 MHz.

Features:

- excellent linearity;
- extremely low noise;
- optimum reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction.

QUICK REFERENCE DATA

Frequency range	f	40 to	450	MHz
Source impedance and load impedance	$Z_S = Z_L$		75	Ω
Power gain at f = 50 MHz	G_p	34,0 ±	1,0	dB
S ope cable equivalent f = 40 MHz to 450 MHz	S_L	0,5 to	2,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	≤	± 0,3	dB
Return losses at input and output f = 40 MHz to 450 MHz	S_{11-22}	≥	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	≥	63,5	dBmV
2nd-order distortion at channel R V_o = 50 dBmV on channels 2 and 13	d_2	≤	−70	dB
Composite triple beat; 52 channels V_o = 46 dBmV	CTB	≤	−59	dB
Output capability Xmod = −57 dB; 52 channels flat	V_o	≥	47	dBmV
Noise figure f = 40 MHz to 450 MHz	F	≤	6	dB
D.C. supply voltage	$+V_B$	=	24	V*
Total d.c. current consumption V_B = +24 V	I_{tot}	typ.	320	mA
Operating mounting base temperature	T_{mb}	−20 to	+90	°C

MECHANICAL DATA

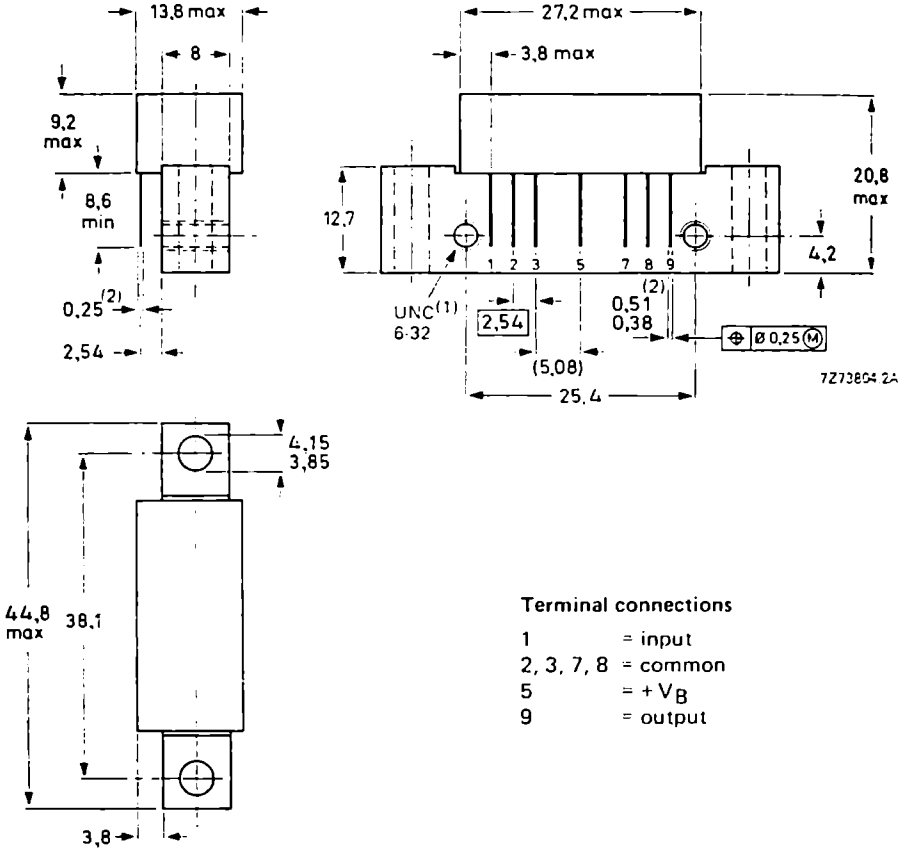
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand incidental supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32UNC-2A available upon request (see Accessory).
(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	55 dBmV
Storage temperature	T_{stg}	−40 to	+100 °C
Operating mounting base temperature	T_{mb}	−20 to	+90 °C*

* With a heatsink ⩽ 3,2 K/W (K/W is SI unit for °C/W) a maximum ambient temperature of +65 °C is permissible.

CHARACTERISTICS

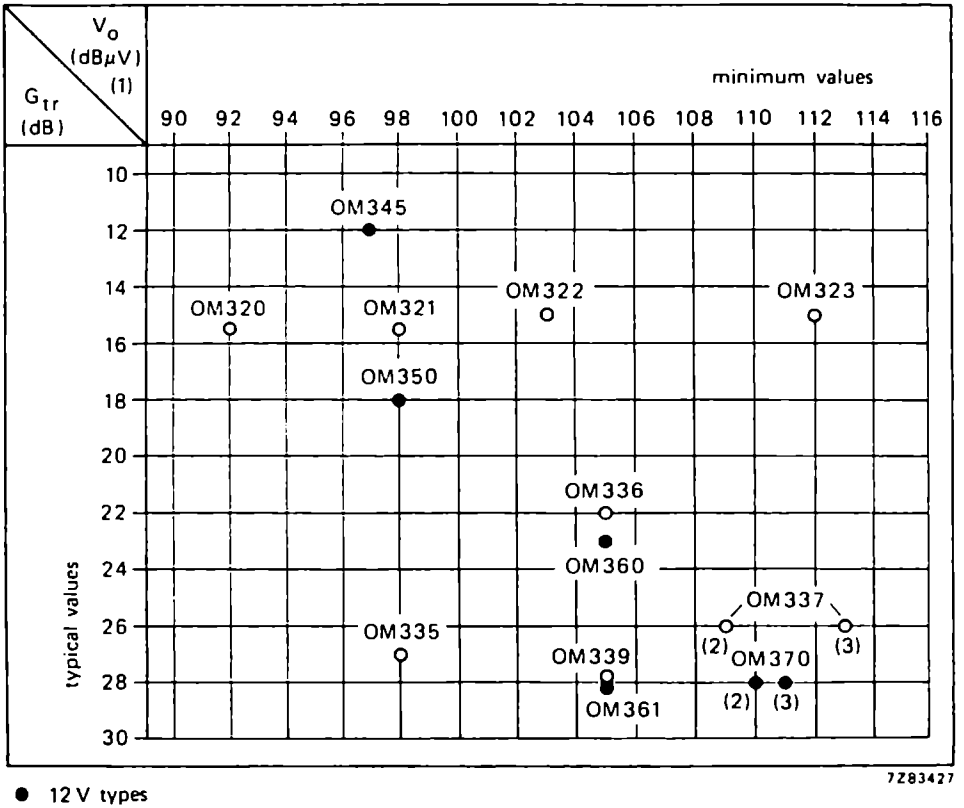
Supply voltage V_B = +24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p	34,0	± 1,0	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L	0,5	to 2,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	⩽	± 0,3	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 450 MHz	S_{11-22}	⩾	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 387,25 MHz $V_q = V_o - 6$ dB; f_q = 394,25 MHz $V_r = V_o - 6$ dB; f_r = 396,25 MHz Measured at $f_{(p+q-r)}$ = 385,25 MHz	V_o	⩾	62	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o - 6$ dB; f_q = 294,25 MHz $V_r = V_o - 6$ dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	63,5	dBmV
2nd order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R V_o = 50 dBmV; channel G V_o = 50 dBmV; channel N	d_2	⩽	−70	dB
Measured at channel H14	d_2	typ.	−67	dB
Composite triple beat 52 channels V_o = 46 dBmV; channel H14	CTB	⩽	−59	dB
Output capability on channel H14 Xmod = −57 dB; 52 channels flat	V_o	⩾	47	dBmV
Noise figure f = 40 MHz to 450 MHz	F	⩽	6	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	320 mA 340 mA	

WIDEBAND AMPLIFIERS (V.H.F. & U.H.F.)

Selection guide

HYBRID ICs FOR WIDE-BAND AMPLIFIERS



● 12 V types

○ 24 V types

(1) At −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone).

(2) UHF.

(3) VHF.

Fig. 1 Type/performance in matrix survey.

The matrix survey (Fig. 1) and the tables next page show both the 12 V and 24 V ranges.

Note that the modules are available in the combination of high gain- high output voltage.

Tables of VHF/UHF hybrid ICs for wide-band amplifiers

12 V supply voltage

	type	stages	gain (dB)	$V_{o(rms)}$(dBμV) −60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2)		supply current (mA)
						input	output	
low medium	OM345	1	12	97	5,5	2,0	1,4	11,5
	OM350	2	18	98	6,0	1,5	1,9	18
medium output	OM360	3	23	105	7,0	1,3	1,5	55
	OM361	3	28	105	6,0	1,5	1,7	50
high output	OM370	3	28	111	7,0	2,3	1,9	105

24 V supply voltage

	type	stages	gain (dB)	$V_{o(rms)}$(dBμV) −60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2)		supply current (mA)
						input	output	
low output	OM320	2	15,5	92	5,5	2,2	2,5	23
	OM321	2	15,5	98	6,0	2,5	2,0	33
	OM335	3	27	98	5,5	1,9	3,2	35
medium output	OM322	2	15	103	7,0	1,7	1,7	60
	OM336	3	22	105	7,0	1,4	1,6	65
	OM339	3	28	105	6,0	1,5	1,5	66
high output	OM323*	2	15	112	9,0	1,9	2,3	100
	OM337*	3	26	113	9,8	2,3	1,8	115

* Also available in A-version for external coil and output capacitor.

Notes

1. Measured at −60 dB intermodulation distortion to DIN 45004, par. 6.3: 3-tone, f = 470 MHz.
2. The typical maximum VSWR occurring in the frequency range 40-860 MHz, for a sample connected to a 75 Ω line.

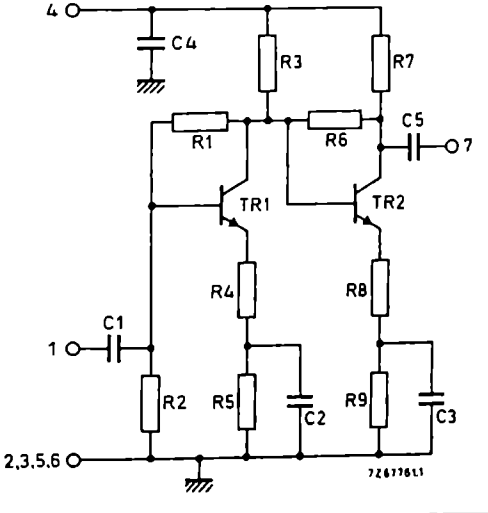
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications

QUICK REFERENCE DATA				
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_{f} \rvert^2$	typ.	15,5	dB
Flatness of frequency response	$\pm\Delta \lvert s_{f} \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	92	dBμV
Noise figure	F	typ.	5,5	dB
D.C. supply voltage	V_B	=	24	V ± 10%
Operating ambient temperature	T_{amb}	−20 to +70		°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, V_{7M}	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_S, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f		40 to 860	MHz

Performance

Supply current	I_B	typ.	23	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		13 to 18	dB
		typ.	15,5	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	2,2	**
output	$VSWR_{(o)}$	typ.	2,5	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	30	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	24	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	92	dBμV
		typ.	94	dBμV
Noise figure	F	typ.	5,5	dB

s-parameters	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

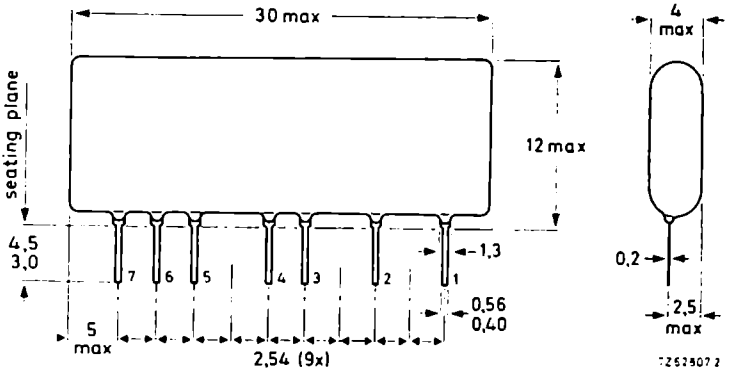
Ambient temperature range	T_{amb}		−20 to +70	°C
D.C. supply voltage	V_B	=	24	V ± 10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_s, R_f	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

1	= Input
2, 3, 5, 6	= Common
4	= Supply (+)
7	= Output

Soldering recommendations

Hand soldering

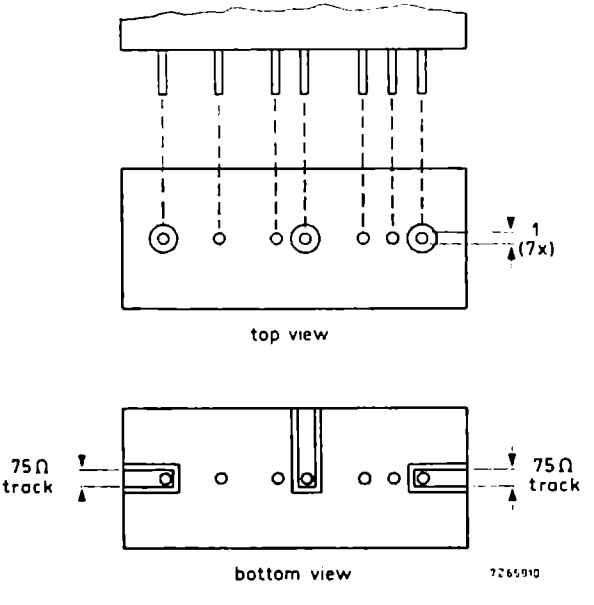
Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane: 5 s

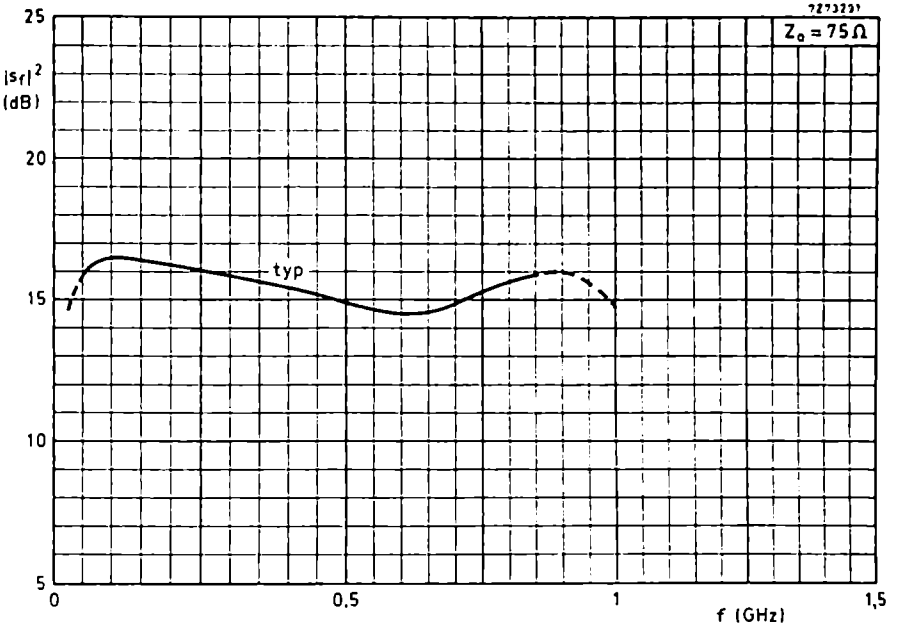
Dip or wave soldering

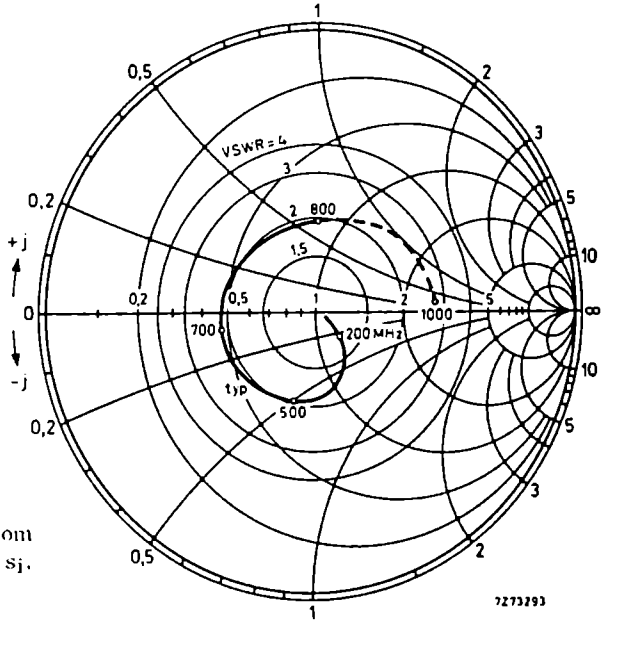
260 °C is the maximum permissible temperature of the solder: it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

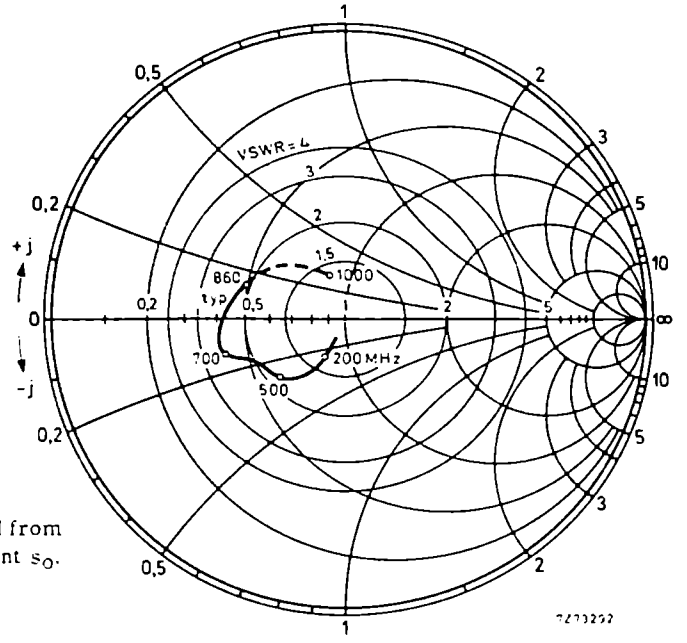
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible







Input impedance derived from input reflection coefficient s_j, co-ordinates in ohm x 75.



Output impedance derived from output reflection coefficient s_o. co-ordinates in ohm x 75.

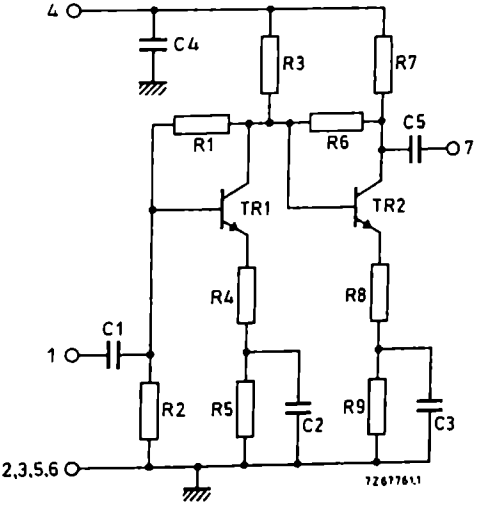
HYBRID VHF/UHF WIDE BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA				
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_l = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	15,5	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	98	dBμV
Noise figure	F	typ.	6	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, $-V_{7M}$	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	33	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		13 to 18	dB
		typ.	15,5	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	2,5	
output	$VSWR_{(o)}$	typ.	2,0	
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	30	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	26	dB
Output voltage				
at −60 dB intermodulation distortion	$V_{o(rms)}$	>	98	dBμV
(DIN45004, par. 6.3: 3-tone)		typ.	100	dBμV
Noise figure	F	typ.	6	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

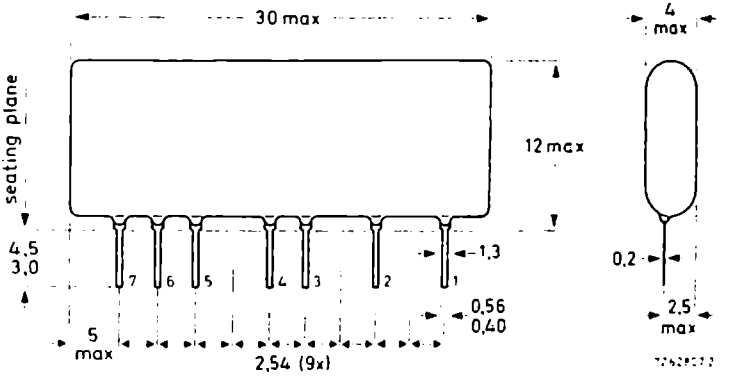
Ambient temperature range	T_{amb}		−20 to + 70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_S, R_f	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

1	= Input
2, 3, 5, 6	= Common
4	= Supply (+)
7	= Output

Soldering recommendations

Hand soldering

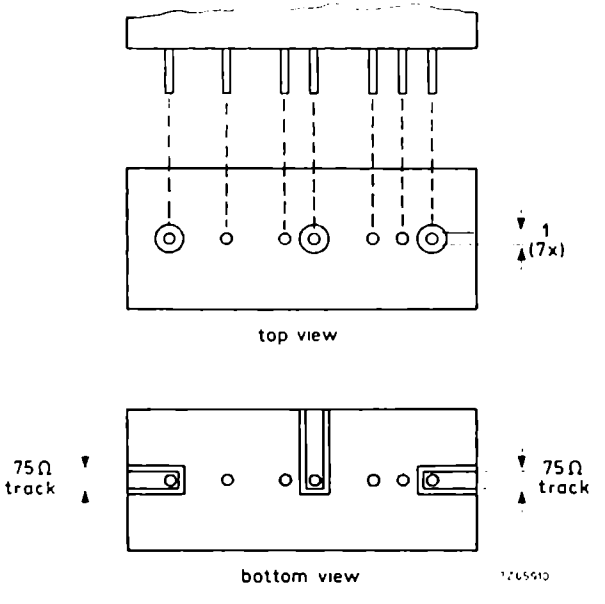
Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane: 5 s

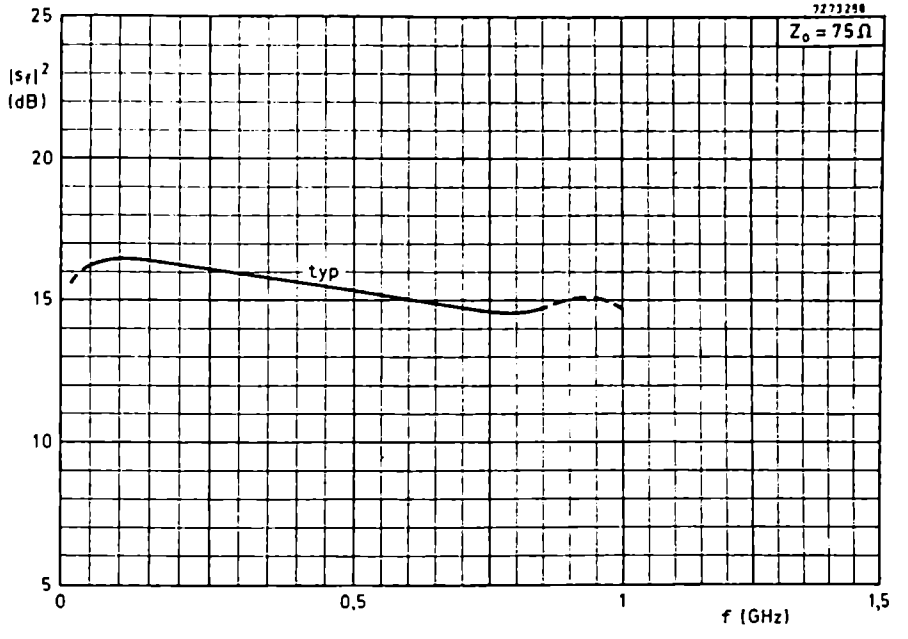
Dip or wave soldering

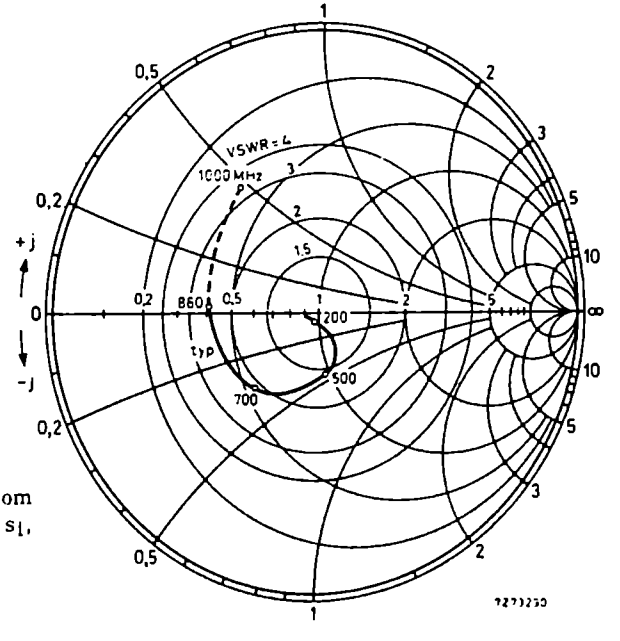
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

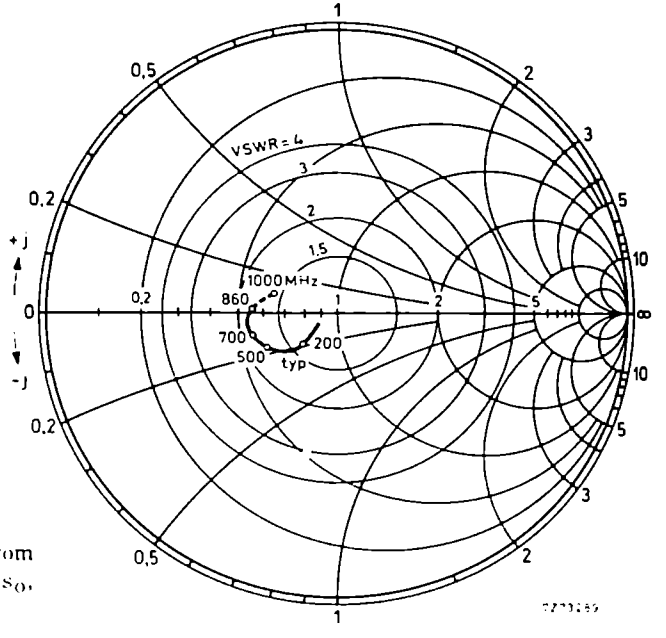
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible







Input impedance derived from input reflection coefficient s_1, co-ordinates in ohm x 75.



Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75.

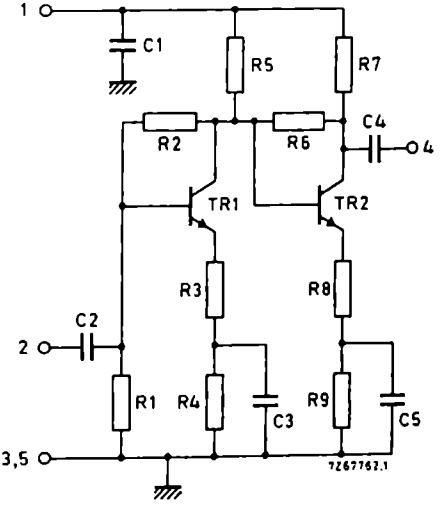
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use as distribution amplifier in MATV and CATV systems and as general-purpose amplifier for v.h.f. and u.h.f. applications. Except for the encapsulation coating, the OM322 and OM175 have the same specification. OM322 will replace OM175.

QUICK REFERENCE DATA				
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_l = Z_o$		75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	0,3	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	103	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 5-lead, resin coated body on metal base, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating ambient temperature	T_{amb}	−20 to +70		°C
Operating mounting-base temperature	T_{mb}	max.	100	°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 2 and 4	V_{2M}, V_{4M}	max.	28	V
	$-V_{2M}$, $-V_{4M}$	max.	10	V
Peak incident powers on pins 2 and 4	P_{12M}, P_{14M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_S, R_f	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	= 40 to 860		MHz

Performance

Supply current	I_B	typ.	60	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	14 to 16		dB
		typ.	15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	0,3	dB
		<	0,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,7	[1]
output	$VSWR_{(o)}$	typ.	1,7	[1]
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	31	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	25	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	103	dBμV
		typ.	105	dBμV
Noise figure	F	typ.	7	dB

s-parameters:		
	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

[1]) Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

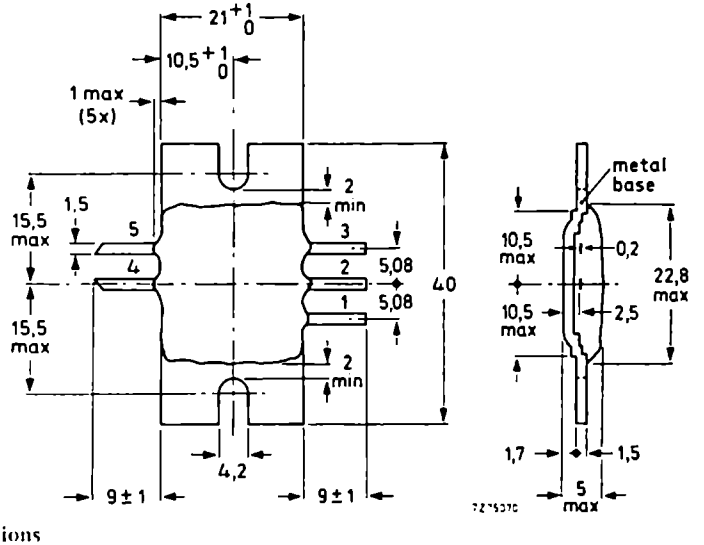
Ambient temperature range	T_{amb}		−20 to +70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_S, R_f	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated and mounted on a metal mounting base.



Terminal connections

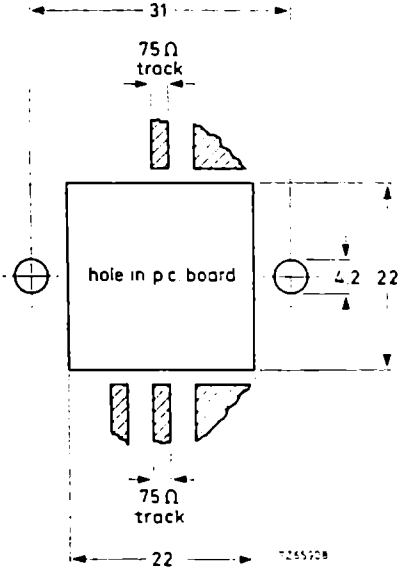
1	=	Supply (+)
2		Input
3 and 5	=	Common (internally connected to metal base)
4	=	Output

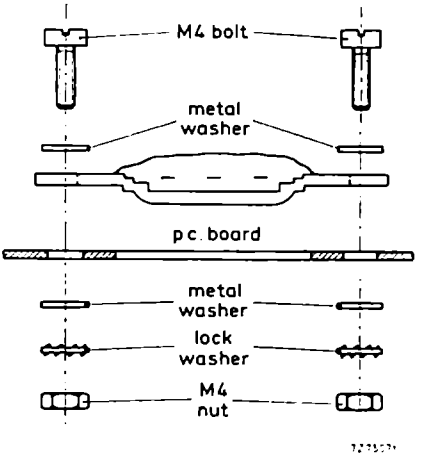
Soldering recommendations

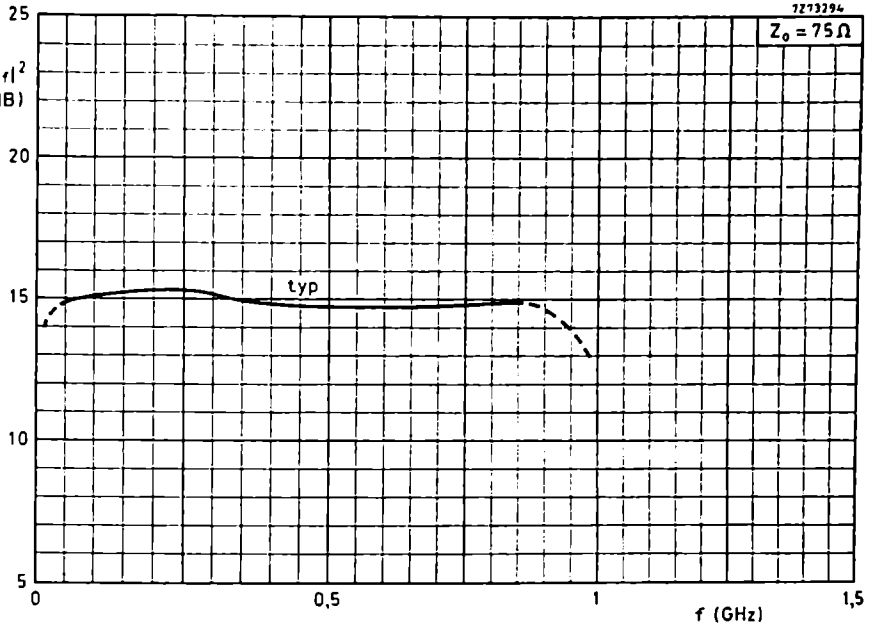
Maximum contact time for a soldering-iron temperature of 260 °C 5 s

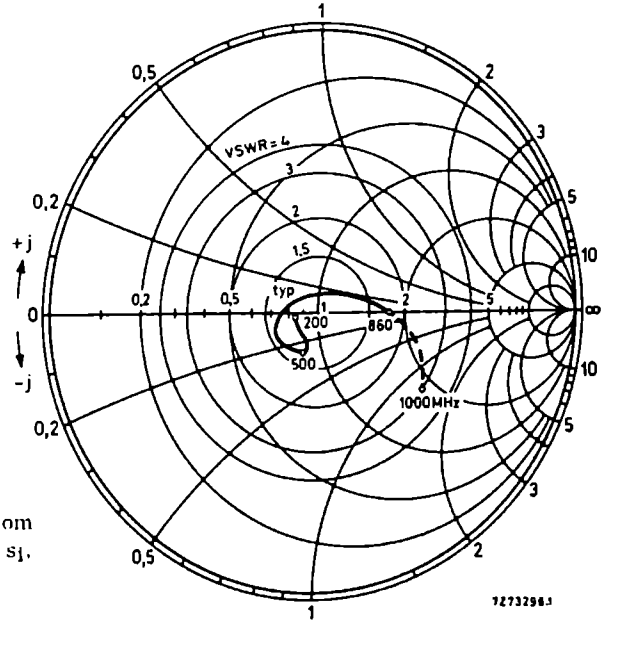
Mounting recommendations

The module should preferably be mounted on a double-sided printed-circuit board, see the examples shown below. Input and output should be connected to 75 Ω tracks.

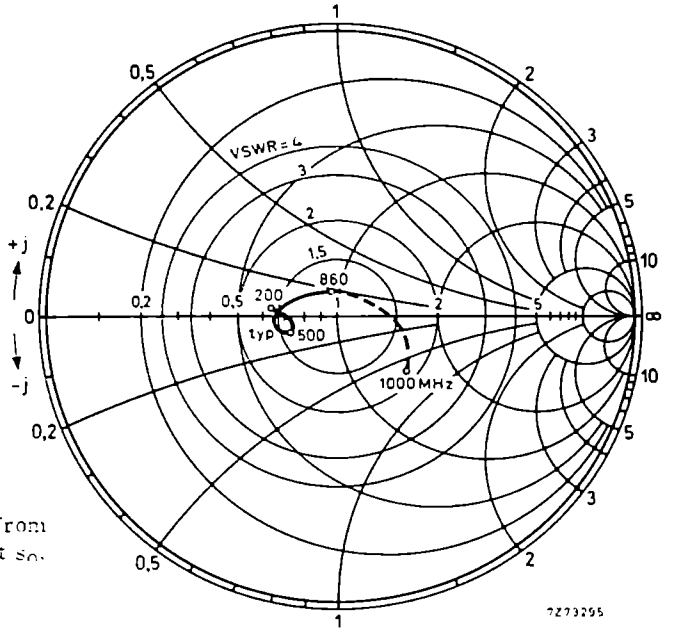








Input impedance derived from input reflection coefficient s_{11}, co-ordinates in ohm x 75



Output impedance derived from output reflection coefficient so. co-ordinates in ohm x 75

HYBRID V.H.F./U.H.F. WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in MATV systems, and as general purpose amplifier for v.h.f. and u.h.f. applications requiring a high output level.
The OM323A needs an external collector-coil and blocking capacitor, whereas, the OM323 has these components built-in.

QUICK REFERENCE DATA

Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_L = Z_o$	= 75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ 15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ 0,5	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone); f = 470 MHz	$V_{o(rms)}$	typ 113	dBμV
Noise figure	F	typ 9	dB
D.C. supply voltage	V_B	= 24	V ± 10%
Operating mounting-base temperature	T_{mb}	−30 to +100	°C

ENCAPSULATION 9-pin, in-line, resin-coated body on a right-angled metal mounting tab, see MECHANICAL DATA

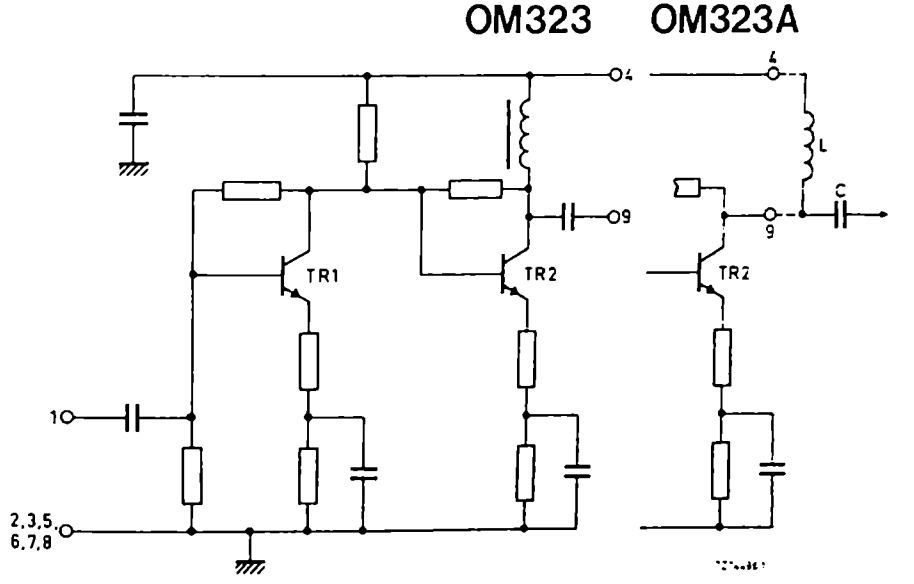


Fig. 1 Circuit diagram.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating mounting-base temperature	T_{mb}	−30 to +100		°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max	28	V
Peak voltages on pin 1	V_{1M}	max	28	V
	$-V_{1M}$	max	24	V
Peak voltages on pin 9	V_{9M}	max	28	V
	$-V_{9M}$	max	4	V
Peak incident powers on pins 1 and 9	P_{I1M}, P_{I9M}	max	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.–U.H.F. test socket	catalogue no. 3504 110 01830 *			
Mounting base temperature	T_{mb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B		95 to 105	mA
		typ	100	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		14 to 17	dB
		typ	15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ	0,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ	1,9	**
output	$VSWR_{(o)}$	typ	2,3	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ	29	dB
f = 650 MHz	$\lvert s_r \rvert^2$	typ	25,5	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ	24	dB

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

Output voltage			
at −60 dB intermodulation distortion			
(DIN45004, par. 6.3: 3-tone)			
f = 40–230 MHz	$V_{o(rms)}$	>	112 dBμV
		typ	114 dBμV
f = 470 MHz	$V_{o(rms)}$	typ	113 dBμV
f = 860 MHz	$V_{o(rms)}$	typ	112 dBμV
Noise figure			
channel 2	F	typ	8 dB
channel 65	F	typ	9 dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$ $s_r = s_{12}$ $s_o = s_{22}$

OPERATING CONDITIONS

Mounting-base temperature range	T_{mb}	−30 to +100	°C
D.C. supply voltage	V_B	= 24	V ± 10%
Frequency range	f	40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	= 75	Ω

THERMAL DATA

a. The maximum permissible temperature at the mounting base is 100 °C.

b. When the mounting tab is screwed to a double-sided printed-circuit board with dimensions 37 mm x 51 mm, its temperature will be 57 °C above the temperature of the surrounding free air.

c. When a heatsink is fixed to the mounting tab and the pins are soldered into a double-sided printed-circuit board with dimensions 37 mm x 51 mm, the tab will reach the temperatures stated in the following table.

Notes

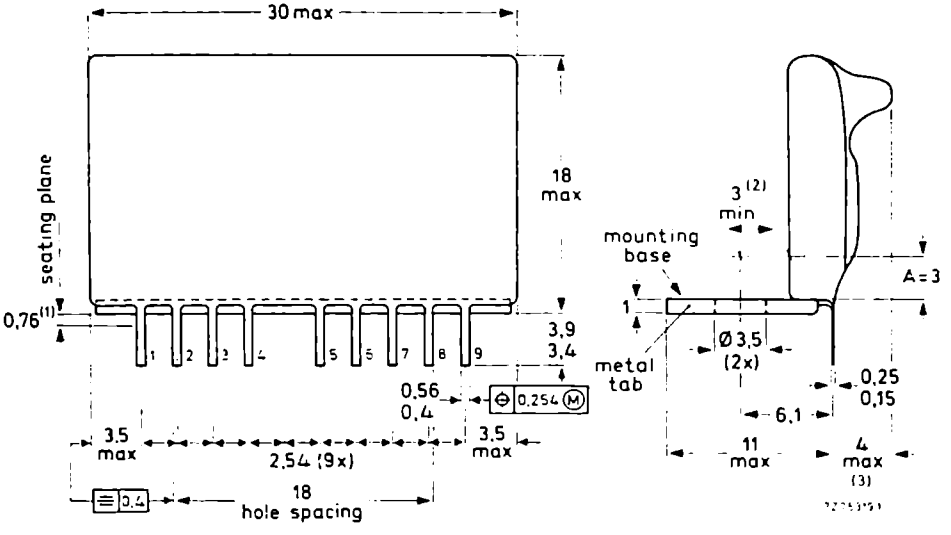
1. When the device is fixed only to a heatsink, not to a printed-circuit board, the values of the second column of the table should be increased by 2 °C and those of the third column decreased by 2 °C.
2. The user is free to realize proper cooling by using differently shaped sinks, or, preferably, by fixing the tab to any convenient part of the equipment (e.g. a wall of the metal cabinet).

Heatsink data thickness 1 mm	$T_{mb} - T_{amb}$ °C	$T_{amb\ max}$ °C
Bright aluminium heatsink L-shaped bar, length 100 mm, height 165 mm	24	76
Blackened aluminium heatsink L-shaped bar; length 50 mm, height 70 mm	23	77

MECHANICAL DATA

Dimensions in mm

The amplifier is resin coated and has a metal mounting tab at a right angle to the encapsulation part.



(1) Tolerance applies within this zone.
(2) Distance applies within zone A.
(3) For the OM323A: 3 mm maximum.

Fig. 2 Encapsulation.

Terminal connections

1	= Input
2, 3, 5, 6, 7, 8	= Common, connected to mounting tab
4	= Supply (+)
9	= Output

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on a double-sided printed-circuit board, see the following example. An example is also given of heatsink mounting.
Input and output should be connected to 75 Ω tracks.
The connections to the common pins should be as close to the seating plane as possible.

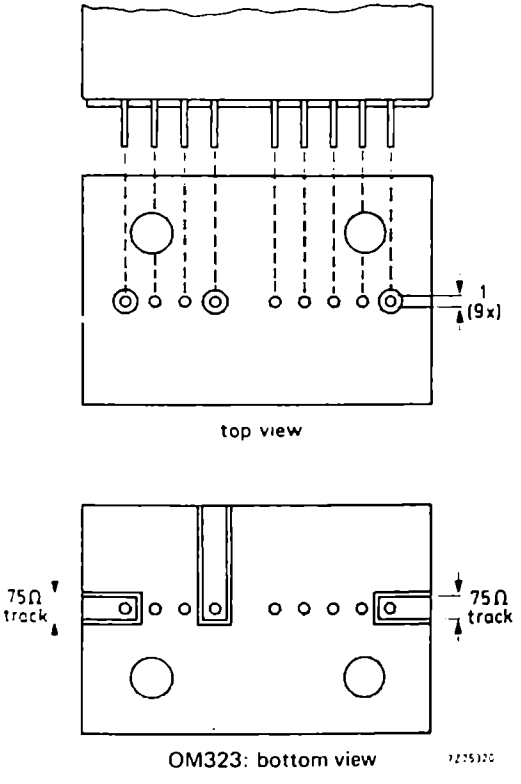


Fig. 3 Printed-circuit board holes and tracks for the OM323 and OM323A.

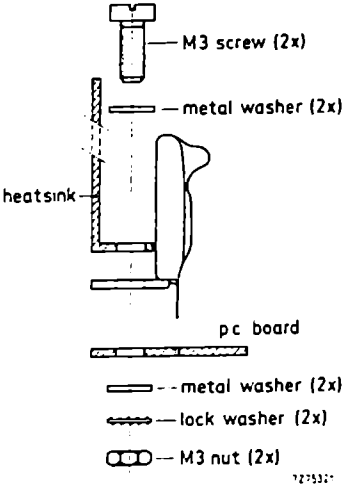


Fig. 4 Example of heatsink mounting.

L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

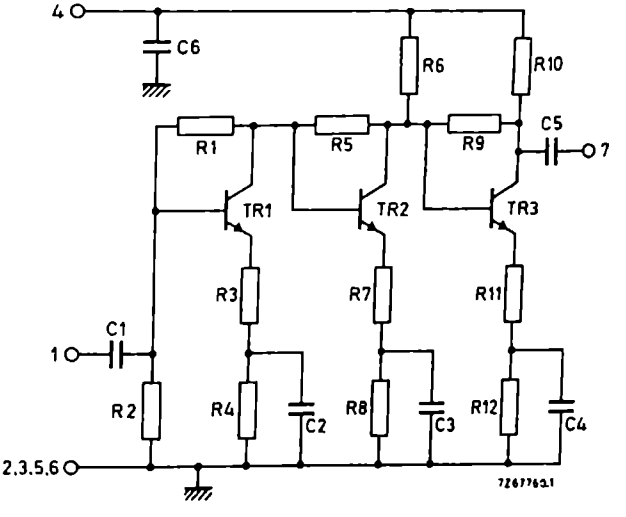
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA				
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_L = Z_O$	=	75	Ω
Transducer gain	$G_{tr} = \|s_f\|^2$	typ.	27	dB
Flatness of frequency response	$\pm\Delta \|s_f\|^2$	typ.	1,6	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	≥	98	dBμV
Noise figure	F	typ.	5,5	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}	−20 to +70		°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, $-V_{7M}$	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	35	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		23 to 31	dB
		typ.	27	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1,6	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,9	**
output	$VSWR_{(o)}$	typ.	3,2	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	46	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	40	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3; 3-tone)	$V_{o(rms)}$	>	98	dBμV
		typ.	101	dBμV
Noise figure	F	typ.	5,5	dB

s-parameters:		
	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

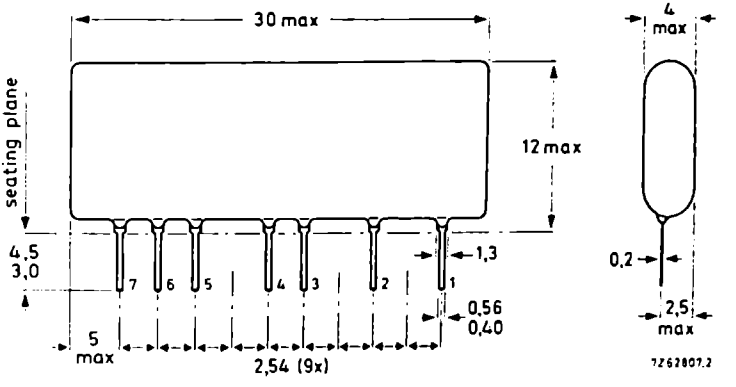
Ambient temperature range	T_{amb}		−20 to + 70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_g, R_ℓ	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

1	= Input
2, 3, 5, 6	= Common
4	= Supply (+)
7	= Output

Soldering recommendations

Hand soldering

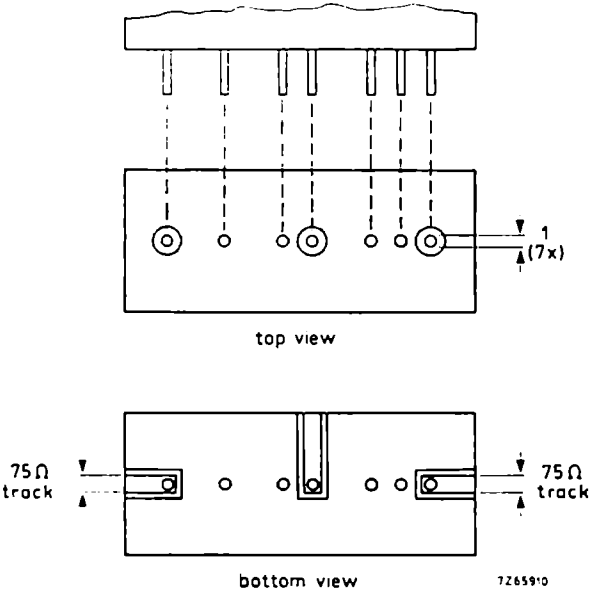
Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane: 5 s

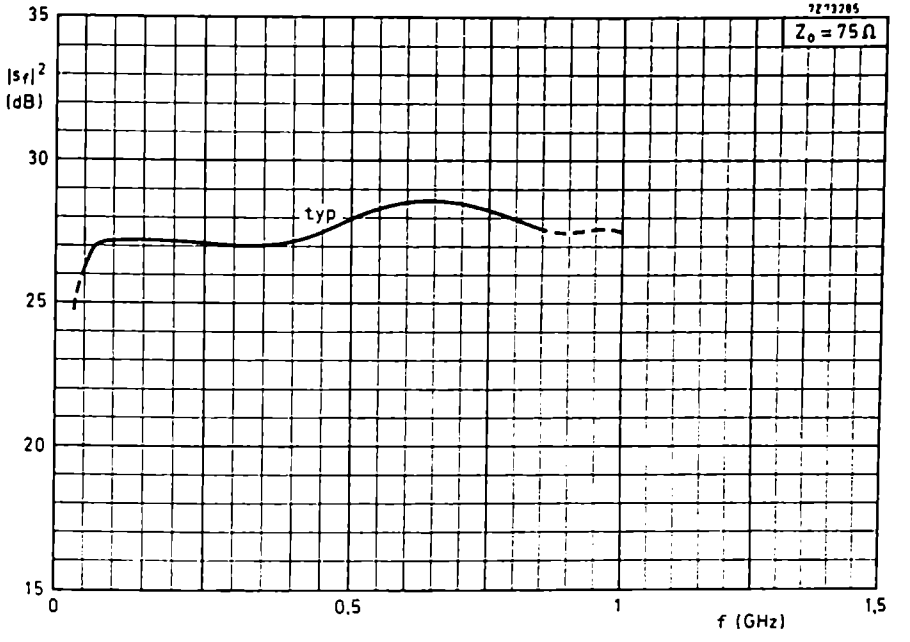
Dip or wave soldering

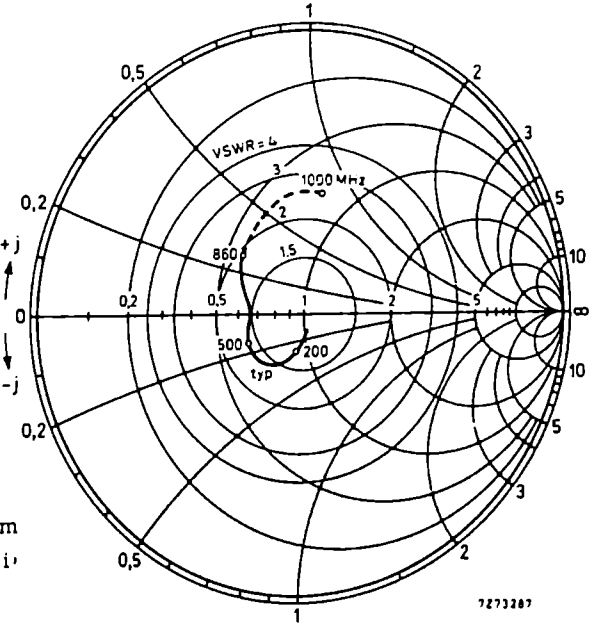
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

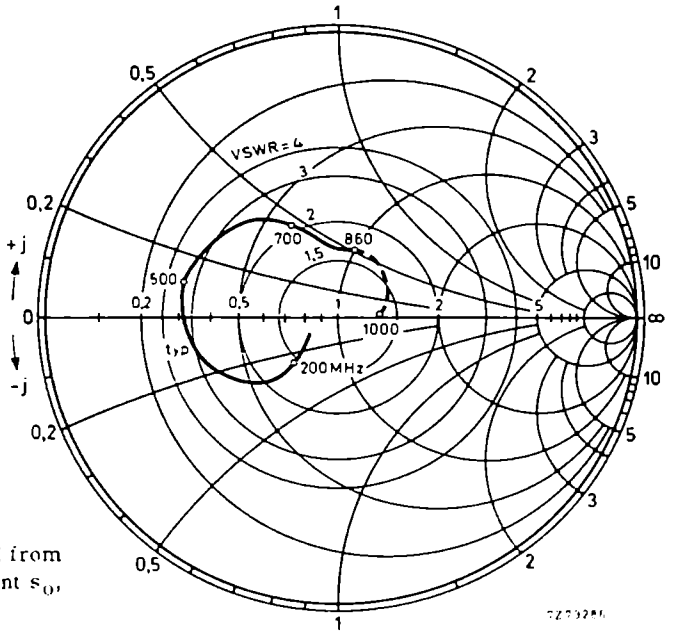
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible







Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75.



Output impedance derived from output reflection coefficient s_0, co-ordinates in ohm x 75.

HYBRID VHF/UHF WIDE-BAND AMPLIFIER

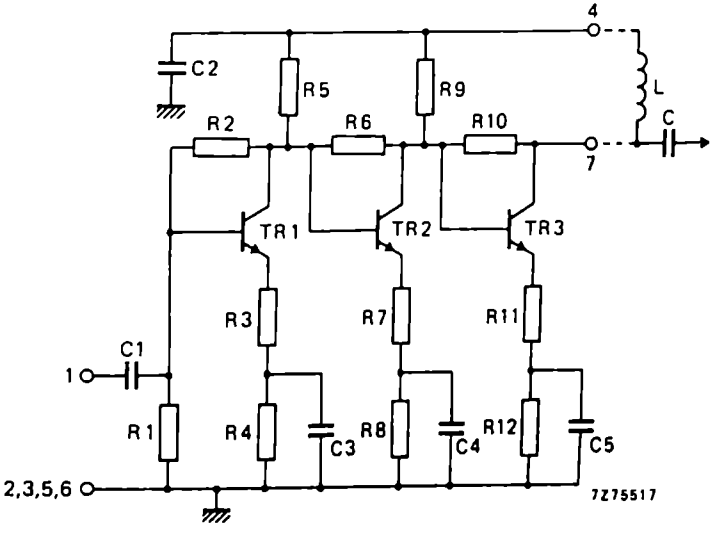
Three-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as preamplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_{fl}\rvert^2$	typ.	22	dB
Flatness of frequency response	$=\Delta\lvert s_f\rvert^2$	typ.	1,0	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}	−20 to +70		°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	−20 to +70		°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, $-V_{7M}$	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	= 40 to 860		MHz

Performance

Supply current	I_B	typ.	65	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	20 to 24		dB
		typ.	22	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1,0	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,4	**
output	$VSWR_{(o)}$	typ.	1,6	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	42	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	40	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	105	dBμV
		typ.	107	dBμV
Noise figure	F	typ.	7	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

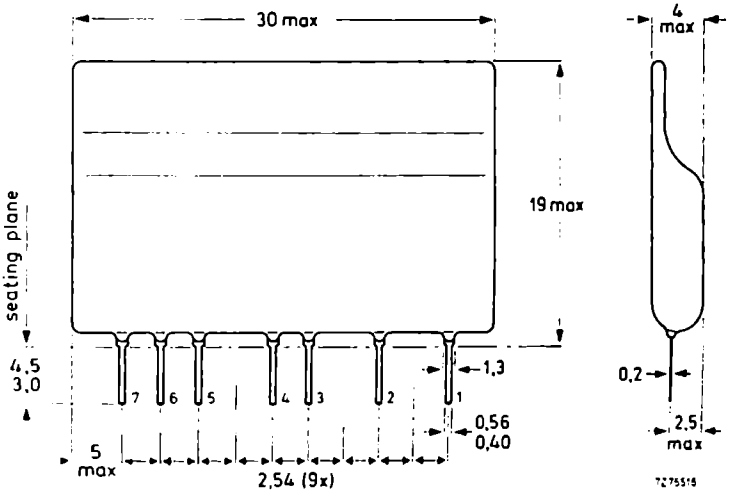
Ambient temperature range	T_{amb}	-20 to +70	°C
D.C. supply voltage	V_B	= 24	V ±10%
Frequency range	f	40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	= 75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

1 = Input
2, 3, 5, 6 = Common
4 = Supply (+)
7 = Output.

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

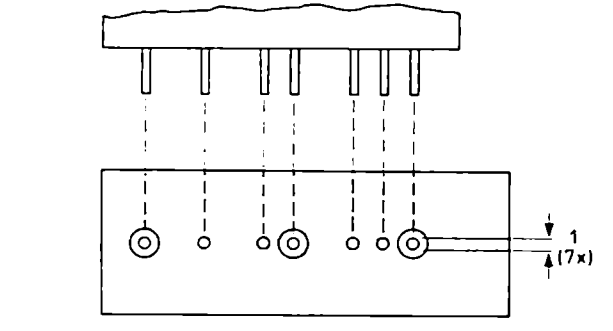
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

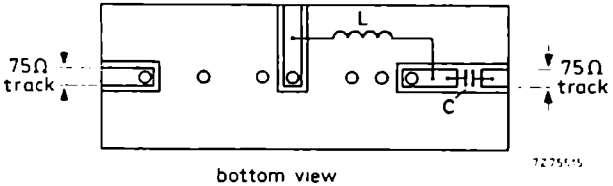
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



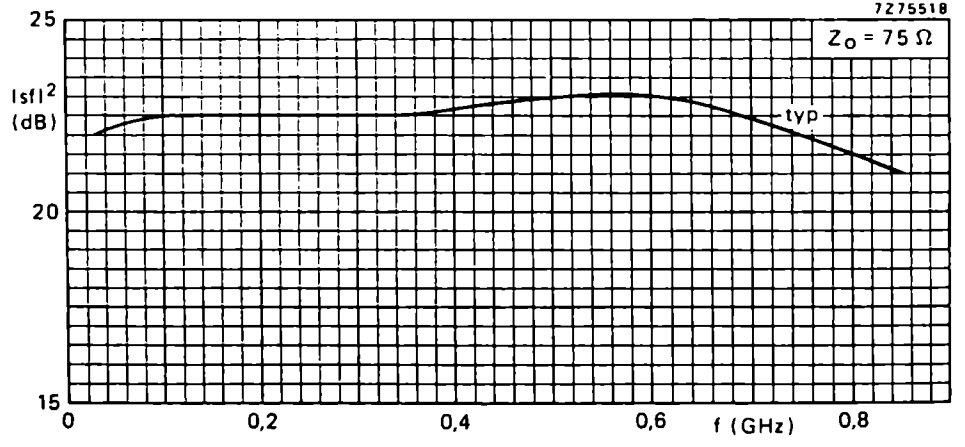
top view



bottom view

L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.

C > 220 pF ceramic capacitor.



HYBRID V.H.F./U.H.F. WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid technique, designed for use in MATV systems, and as general purpose amplifier for v.h.f. and u.h.f. applications requiring a high output level.
The OM337A needs an external collector-coil and blocking capacitor, whereas, the OM337 has these components built-in.

QUICK REFERENCE DATA

Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	= 75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ. 26	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ. 1	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone); f = 470 MHz	$V_{o(rms)}$	typ. 112	dBμV
Noise figure	F	typ. 9.8	dB
D.C. supply voltage	V_B	= 24	V ± 10%
Operating mounting-base temperature	T_{mb}	−30 to +100	°C

ENCAPSULATION 9-pin, in-line, resin-coated body on a right-angled metal mounting tab, see MECHANICAL DATA

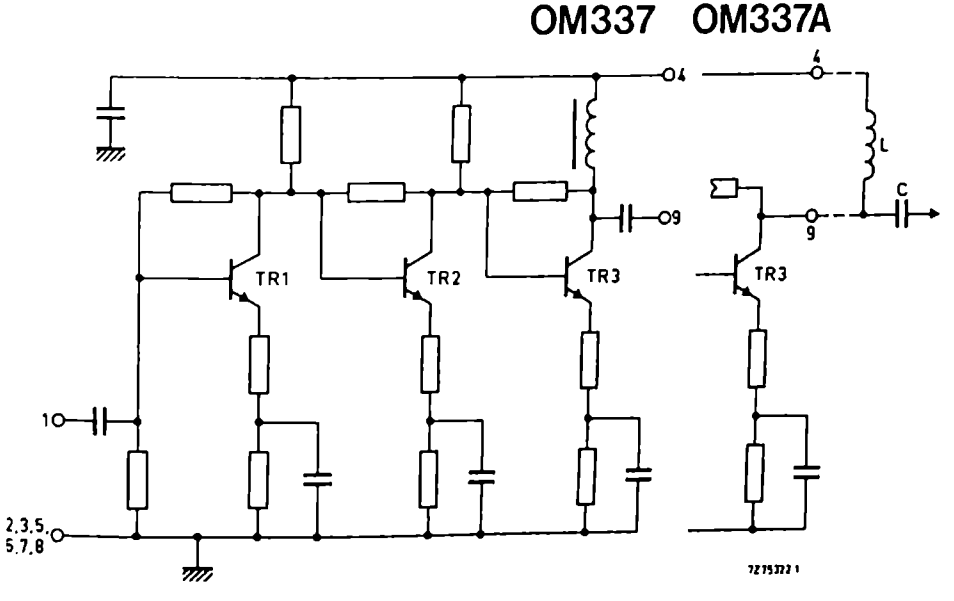


Fig. 1 Circuit diagram.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating mounting-base temperature	T_{mb}	−30 to +100		°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pin 1	V_{1M}	max.	28	V
	$-V_{1M}$	max.	24	V
Peak voltages on pin 9	V_{9M}	max.	28	V
	$-V_{9M}$	max.	4	V
Peak incident powers on pins 1 and 9	P_{I1M}, P_{I9M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.–U.H.F. test socket	catalogue no. 3504 110 01830*			
Mounting base temperature	T_{mb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	= 40 to 860		MHz

Performance

Supply current	I_B		110 to 120	mA
		typ.	115	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		23 to 29	dB
		typ.	26	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	2,3	**
output	$VSWR_{(o)}$	typ.	1,8	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	44	dB
f = 650 MHz	$\lvert s_r \rvert^2$	typ.	41	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	43	dB

* This socket can be made available for customer reference purposes.
** Highest value, for a sample, occurring in the frequency range.

Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)				
f = 40–230 MHz	$V_{o(rms)}$	>	113	dBμV
		typ.	114	dBμV
f = 470 MHz	$V_{o(rms)}$	typ.	112	dBμV
f = 860 MHz	$V_{o(rms)}$	typ.	110	dBμV
Noise figure				
channel 2	F	typ.	7	dB
channel 65	F	typ.	9,8	dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$ $s_r = s_{12}$ $s_o = s_{22}$

OPERATING CONDITIONS

Mounting-base temperature range	T_{mb}		−30 to +100	°C
D.C. supply voltage	V_B	=	24	V ± 10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω

THERMAL DATA

a. The maximum permissible temperature at the mounting base is 100 °C.

b. When the mounting tab is screwed to a double-sided printed-circuit board with dimensions 37 mm x 51 mm, its temperature will be 57 °C above the temperature of the surrounding free air.

c. When a heatsink is fixed to the mounting tab and the pins are soldered into a double-sided printed-circuit board with dimensions 37 mm x 51 mm, the tab will reach the temperatures stated in the following table.

Notes:

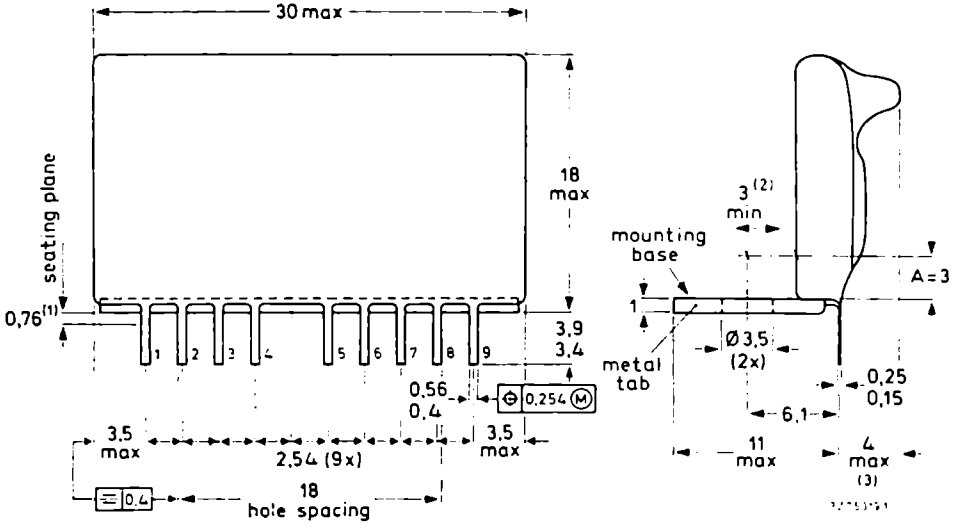
1. When the device is fixed only to a heatsink, not to a printed-circuit board, the values of the second column of the table should be increased by 2 °C and those of the third column decreased by 2 °C.
2. The user is free to realize proper cooling by using differently shaped sinks, or, preferably, by fixing the tab to any convenient part of the equipment (e.g. a wall of the metal cabinet).

heatsink data thickness 1 mm	$T_{mb} - T_{amb}$ °C	$T_{amb\,max}$ °C
Bright aluminium heatsink L-shaped bar; length 100 mm, height 65 mm	27,5	72,5
Blackened aluminium heatsink L-shaped bar; length 50 mm, height 70 mm	26,5	73,5

MECHANICAL DATA

Dimensions in mm

The amplifier is resin coated and has a metal mounting tab at a right angle to the encapsulated part.



(1) Tolerance applies within this zone.
(2) Distance applies within zone A.
(3) For the OM337A: 3 mm maximum.

Fig. 2 Encapsulation.

Terminal connections

1 = Input
2, 3, 5, 6, 7, 8 = Common, connected to mounting tab
4 = Supply (+)
9 = Output

Soldering recommendations

Hand soldering

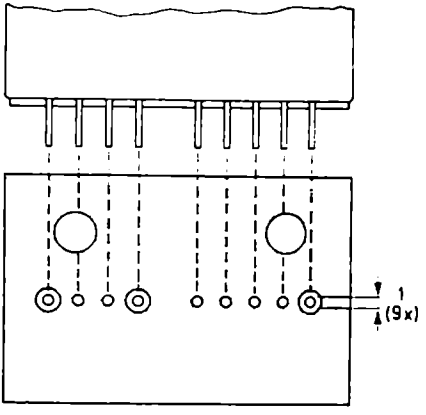
Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

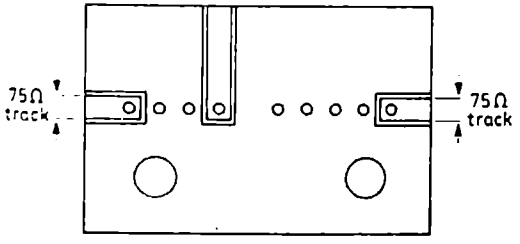
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

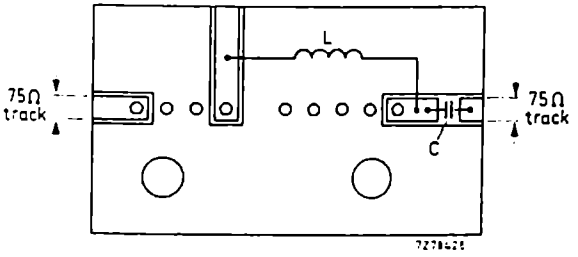
The module should preferably be mounted on a double-sided printed-circuit board, see the following example. An example is also given of heatsink mounting.
Input and output should be connected to 75 Ω tracks.
The connections to the common pins should be as close to the seating plane as possible.



top view



OM337: bottom view.



OM337A: bottom view.

Fig. 3 Printed-circuit board holes and tracks for the OM337 and OM337A.

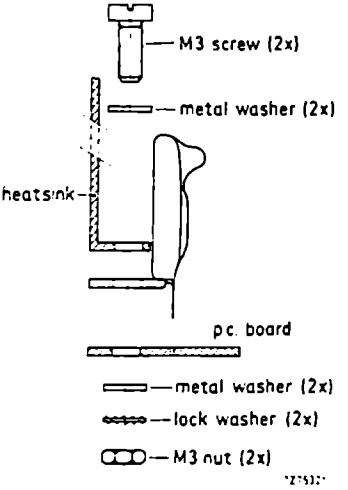


Fig. 4 Example of heatsink mounting.

L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

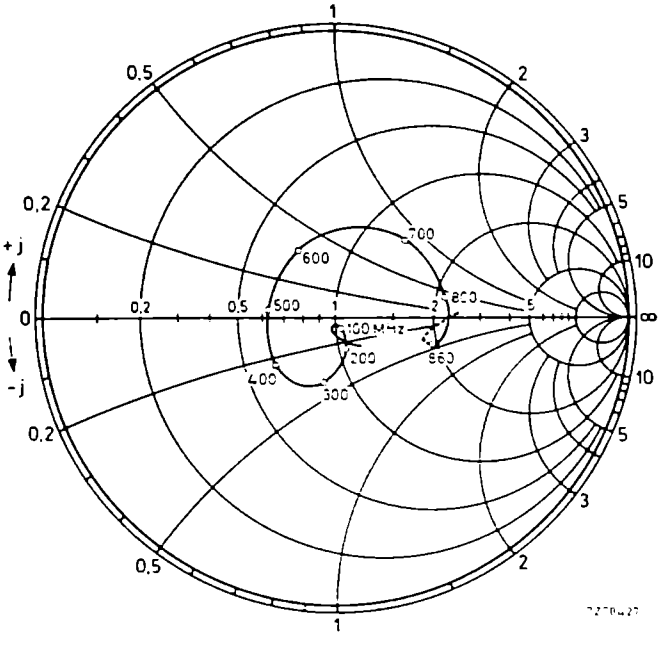


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

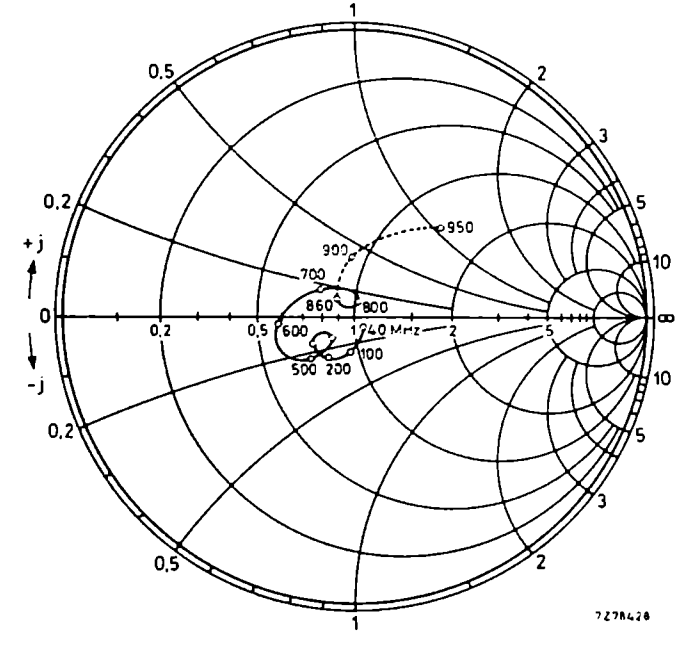


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

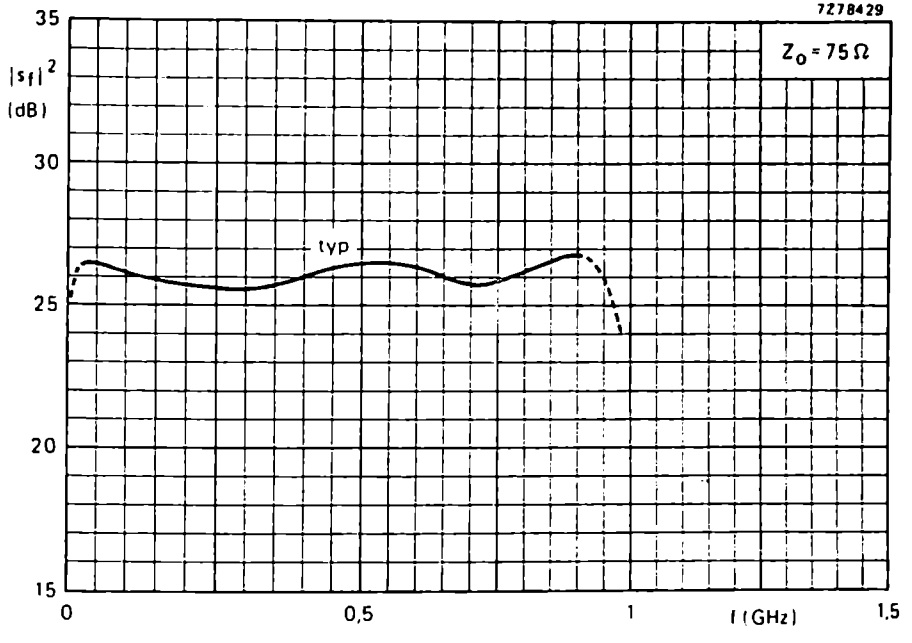


Fig. 7 Transducer gain as a function of frequency.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid integrated circuit technique, designed for use in mast-head booster-amplifiers, as amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_L = Z_o$	= 75	Ω
Transducer gain	$G_{tr} = s_{f}^{2}$	typ. 28	dB
Flatness of frequency response	$\pm\Delta\lvert s_f\rvert^2$	typ. 1,5	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	> 105	dBμV
Noise figure	F	typ. 6	dB
D.C. supply voltage	V_B	= 24	V ±10%
Operating ambient temperature	T_{amb}	−20 to +70	°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

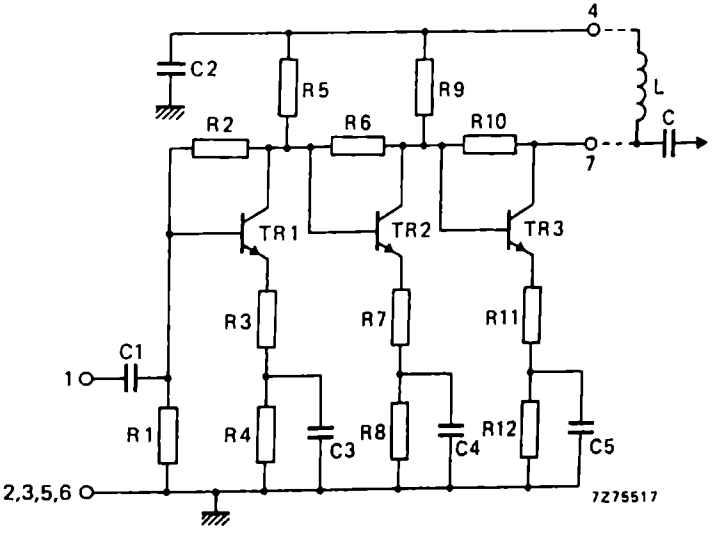


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	−20 to +70		°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, $-V_{7M}$	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	= 40 to 860		MHz

Performance

Supply current	I_B	typ.	67	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	25 to 30		dB
		typ.	28	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,5	**
output	$VSWR_{(o)}$	typ.	1,5	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	46	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	31	dB
Output voltage				
at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	105	dBμV
		typ.	107	dBμV
Noise figure	F	typ.	6	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}	−20 to +70 °C
D.C. supply voltage	V_B	= 24 V ±10%
Frequency range	f	40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	= 75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

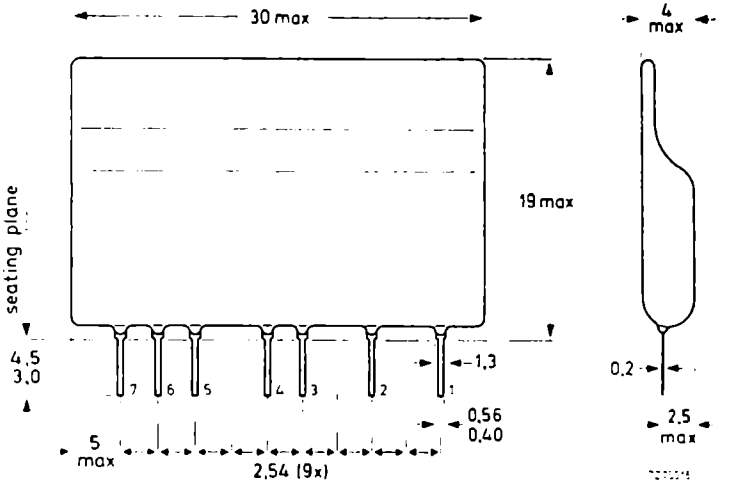


Fig. 2 Encapsulation.

Terminal connections

1 = input
2, 3, 5, 6 = common
4 = supply (+)
7 = output

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

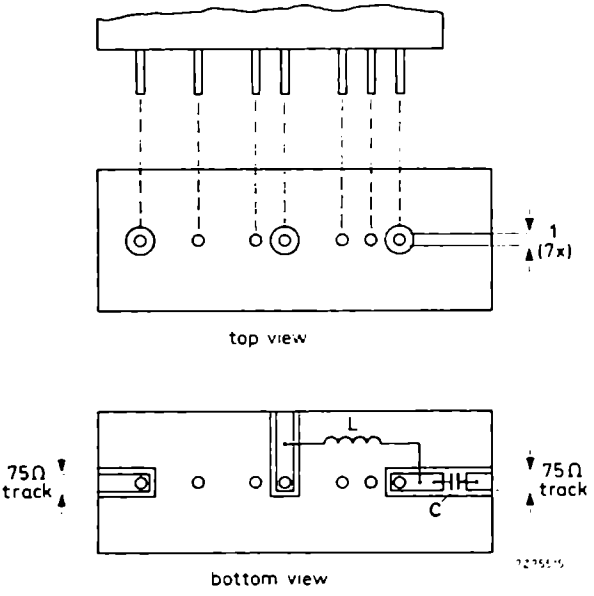
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



$L > 5\ \mu H$; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
$C > 220$ pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

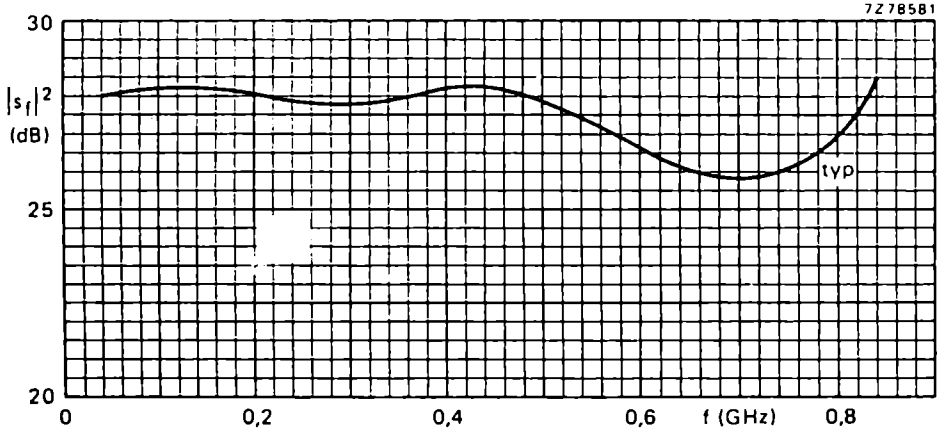


Fig. 4 Transducer gain as a function of frequency; $Z_o = 75\ \Omega$.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

One-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for aerial amplifiers in car radios, caravans or RATV and MATV applications.

QUICK REFERENCE DATA

D.C. supply voltage	V_B	=	12 V ± 10%
Frequency range	f		40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75 Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	12 dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ.	1 dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	typ.	99 dBμV
Noise figure	F	typ.	5,5 dB
Operating ambient temperature	T_{amb}		−20 to + 70 °C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

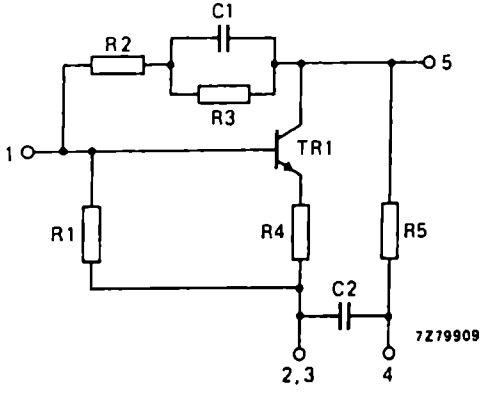


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	−20 to +70	°C
Storage temperature	T_{stg}	−40 to +125	°C
D.C. supply voltage	V_B	max. 15	V
Peak incident powers on pins 1 and 5	P_{I1M}, P_{I5M}	max. 100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	= 25	°C
D.C. supply voltage	V_B	= 12	V
Source impedance and load impedance	R_s, R_ℓ	= 75	Ω
Characteristic impedance of h.f. connections	Z_o	= 75	Ω
Frequency range	f	= 40 to 860	MHz

Performance

Supply current	I_B	typ. 11,5	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ. 12	dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ. 1	dB
Individual maximum v.s.w.r.			
input	$VSWR_{(i)}$	typ. 2,0	*
output	$VSWR_{(o)}$	typ. 1,4	*
Back attenuation			
f = 100 MHz	$\lvert s_r \rvert^2$	typ. 22	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ. 19	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	typ. 99	dBμV
Noise figure	F	typ. 5,5	dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$ $s_r = s_{12}$ $s_o = s_{22}$

* Highest value, for a sample, occuring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to + 70 °C
D.C. supply voltage	V_B	=	12 V ±10%
Frequency range	f		40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	=	75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

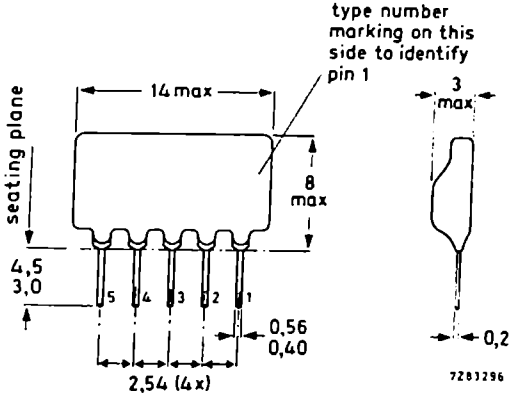


Fig. 2 Encapsulation.

Terminal connections

1 = input
2,3 = common
4 = supply (+)
5 = output

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.

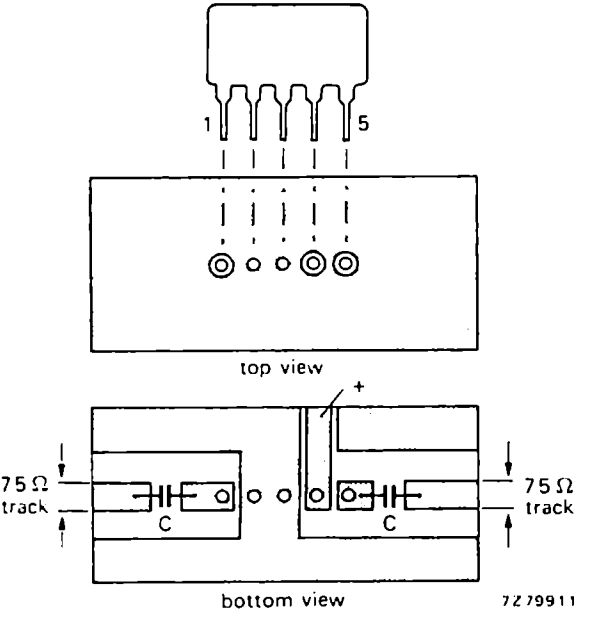


Fig. 3 Printed-circuit board holes and tracks.
C > 220 pF ceramic capacitor.

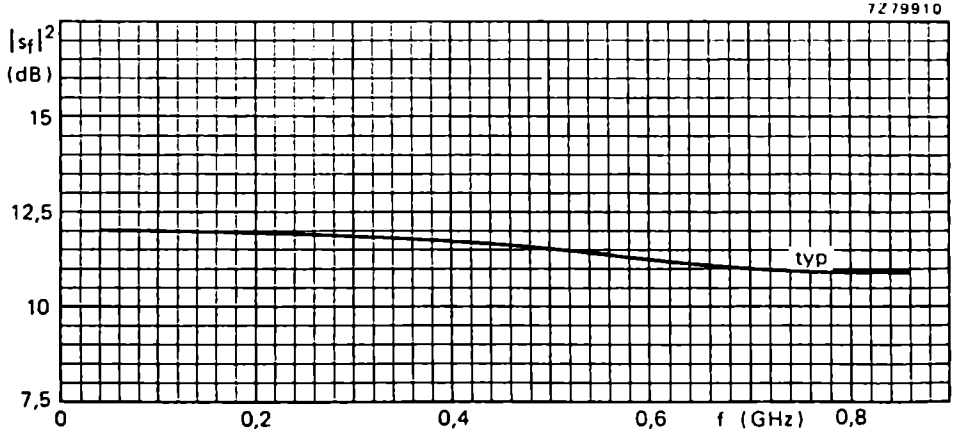


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

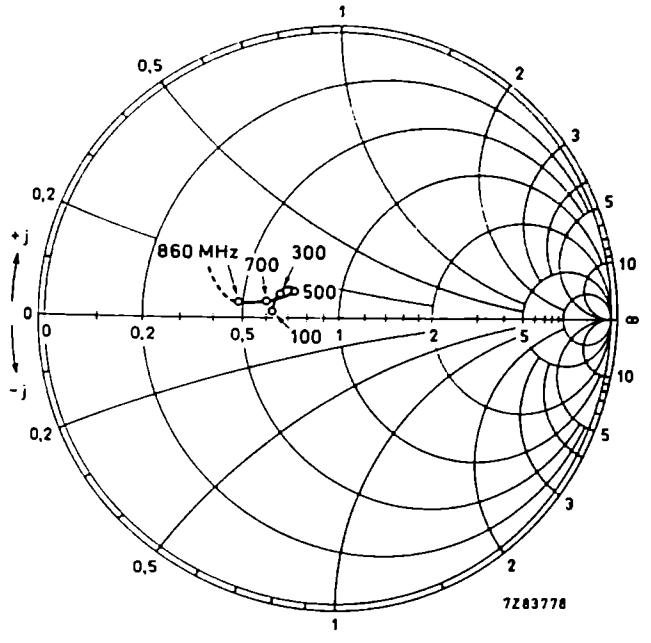


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

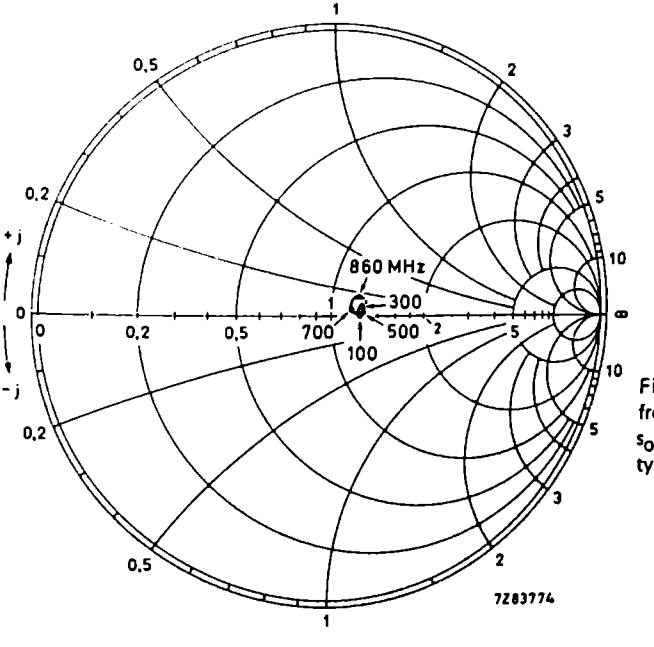


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

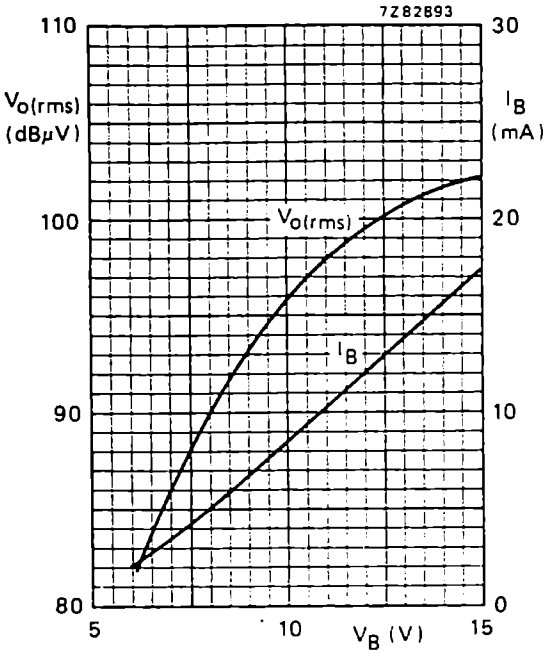


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

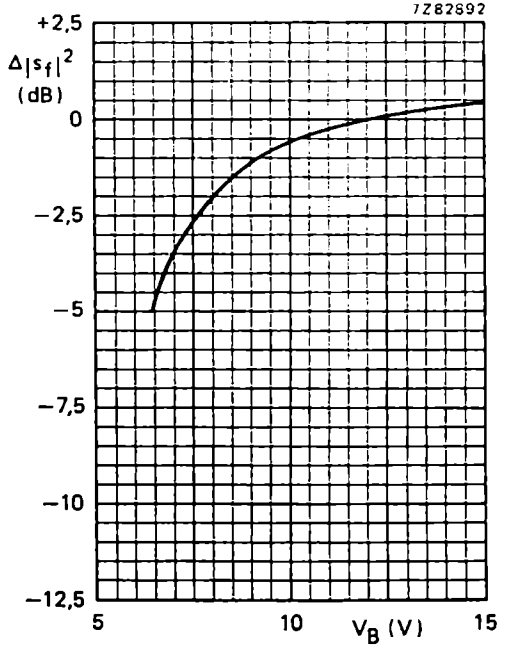


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V; f = 100 to 860 MHz; typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for RATV and MATV applications.

QUICK REFERENCE DATA

D.C. supply voltage	V_B	=	12 V ± 10%
Frequency range	f		40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75 Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	18 dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ.	1 dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	typ.	100 dBμV
Noise figure	F	typ.	6 dB
Operating ambient temperature	T_{amb}		−20 to + 70 °C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

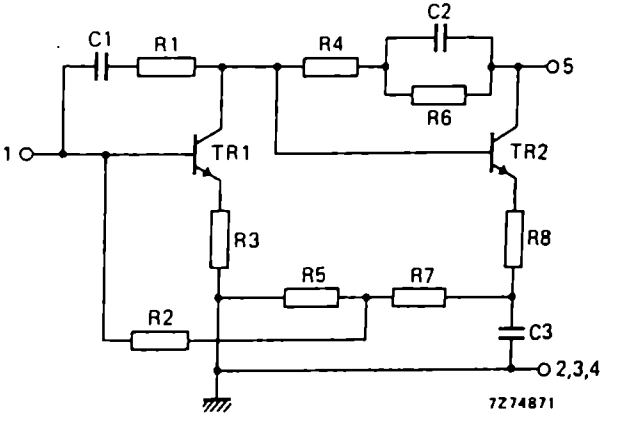


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	−20 to + 70		°C
Storage temperature	T_{stg}	−40 to + 125		°C
D.C. supply voltage	V_B	max.	15	V
Peak incident powers on pins 1 and 5	P_{I1M}, P_{I5M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	12	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	18	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	18	dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,5	*
output	$VSWR_{(o)}$	typ.	1,9	*
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	29	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	25	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	typ.	100	dBμV
Noise figure	F	typ.	6	dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$ $s_r = s_{12}$ $s_o = s_{22}$

* Highest value, for a sample, occuring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to + 70 °C
D.C. supply voltage	V_B	=	12 V ± 10%
Frequency range	f		40 to 860 MHz
Source impedance and load impedance	R_S, R_L	=	75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

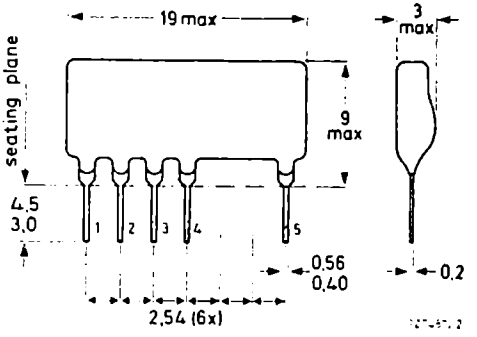


Fig. 2 Encapsulation.

Terminal connections

1 = input
2,3,4 = common
5 = output/supply(+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

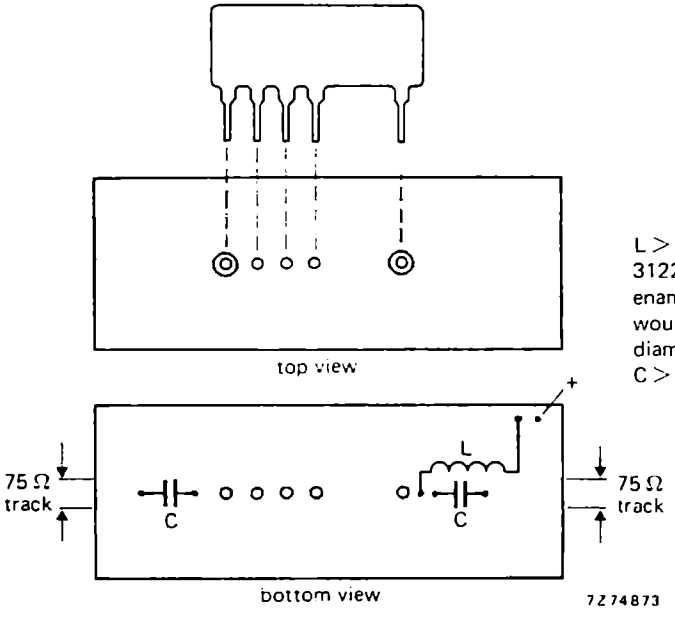
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

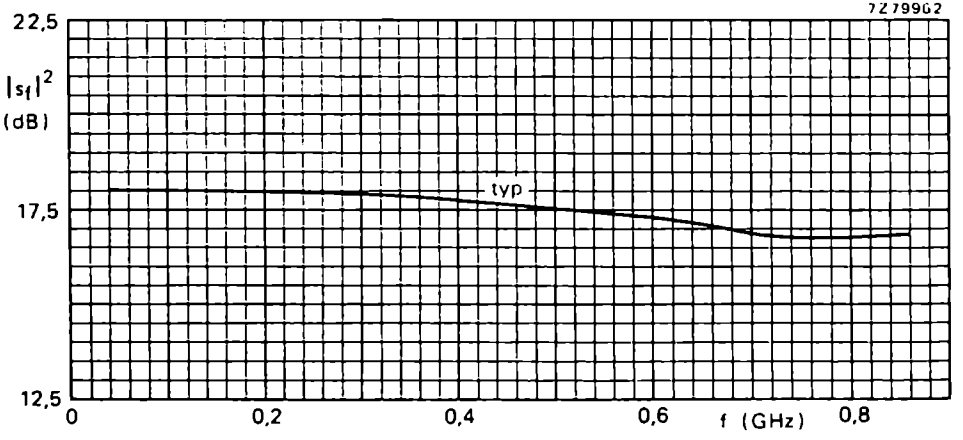


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

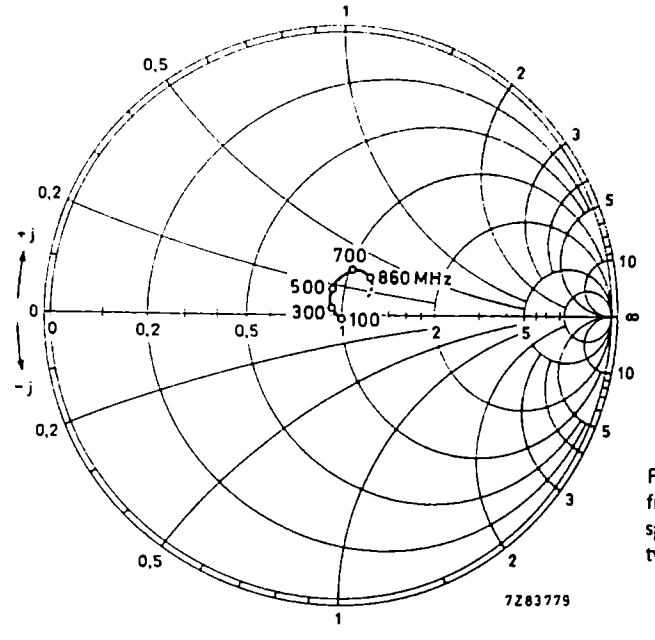


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

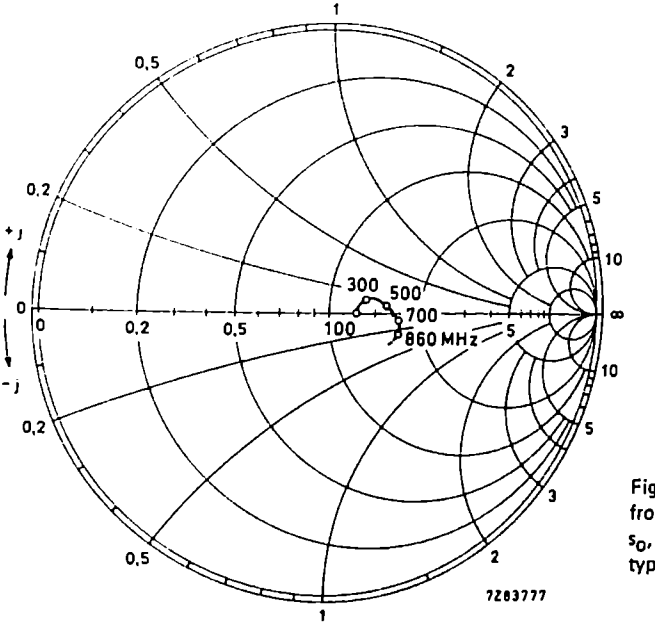


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

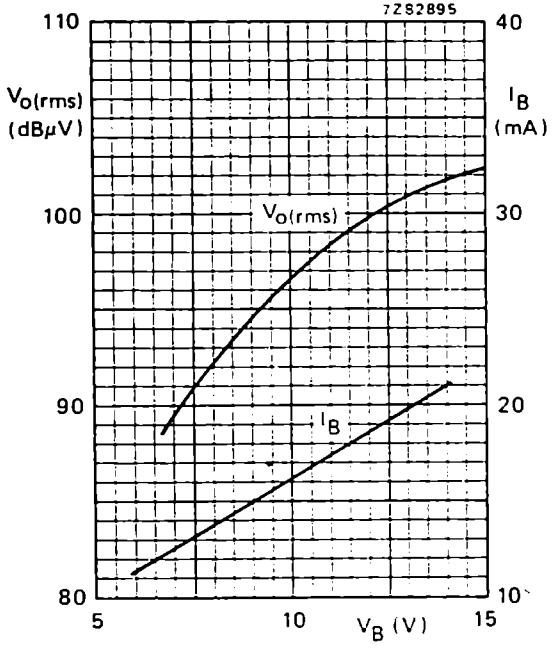


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

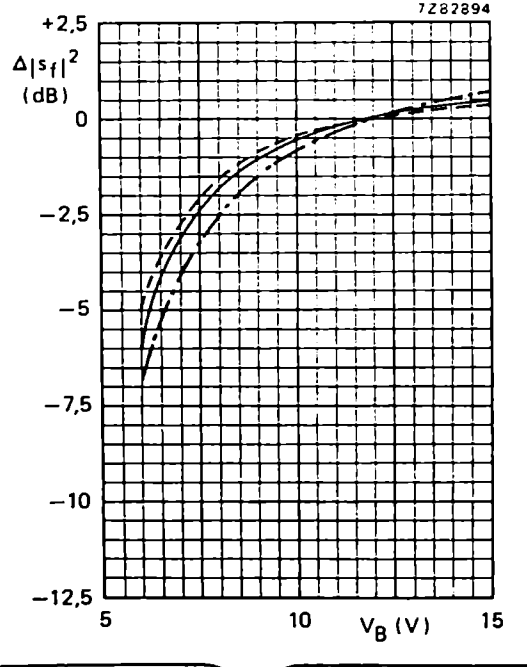


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V:
——— f = 500 MHz;
– – – – f = 100 MHz;
–·–·– f = 860 MHz;
typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for use in mast-head booster-amplifiers, as preamplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	= 75	Ω
Transducer gain	$G_{tr} = \lvert s_{fi}\rvert^2$	typ. 23	dB
Flatness of frequency response	$\pm\Delta\lvert s_{fi}\rvert^2$	typ. 0,5	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	> 105	dBμV
Noise figure	F	typ. 7	dB
D.C. supply voltage	V_B	= 12	V ± 10%
Operating ambient temperature	T_{amb}	−20 to +70	°C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

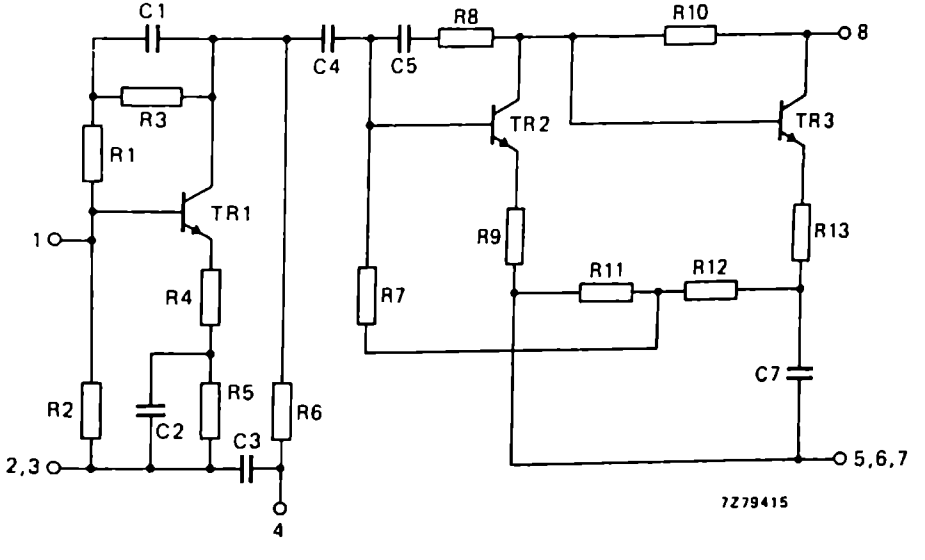


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	15	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	12	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	55	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	23 21 to 25	dB dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	0,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,3	*
output	$VSWR_{(o)}$	typ.	1,5	*
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	42	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	33	dB
Output voltage				
at −60 dB intermodulation distortion	$V_{o(rms)}$	>	105	dBμV
(DIN 45004, par. 6.3: 3-tone)		typ.	107	dBμV
Noise figure	F	typ.	7	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}	−20 to +70 °C
D.C. supply voltage	V_B	= 12 V ± 10%
Frequency range	f	40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	= 75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

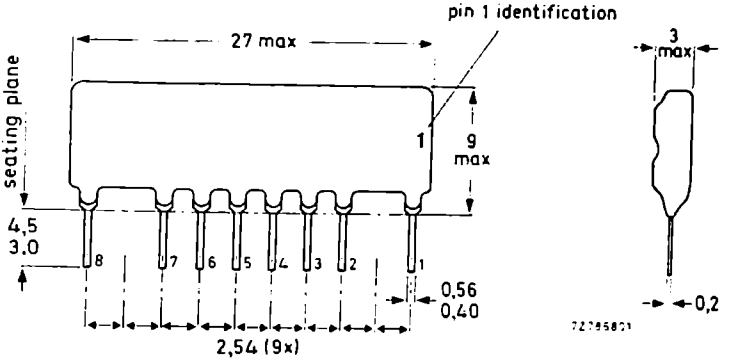


Fig. 2 Encapsulation.

Terminal connections

1 = input
2, 3, 5, 6, 7 = common
4 = supply (+)
8 = output/supply (+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

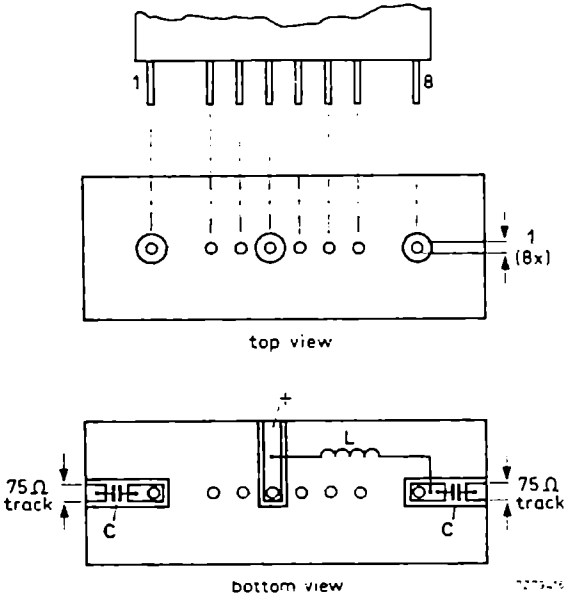
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

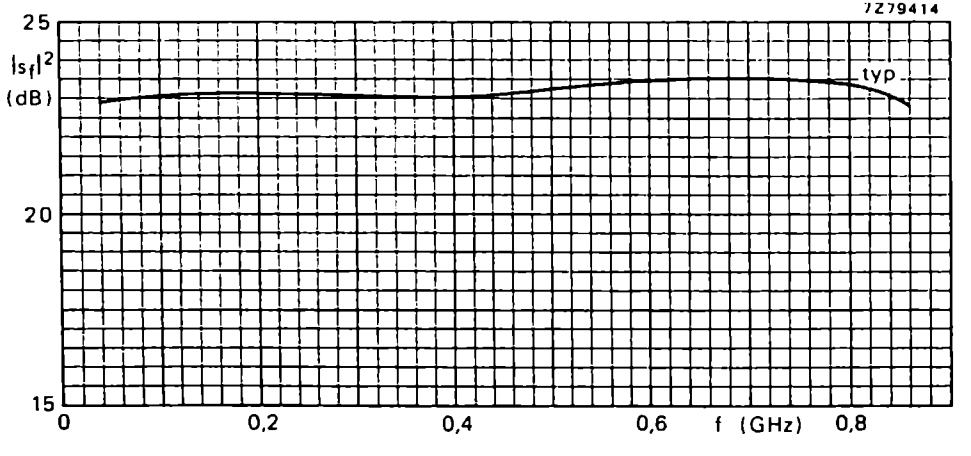


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

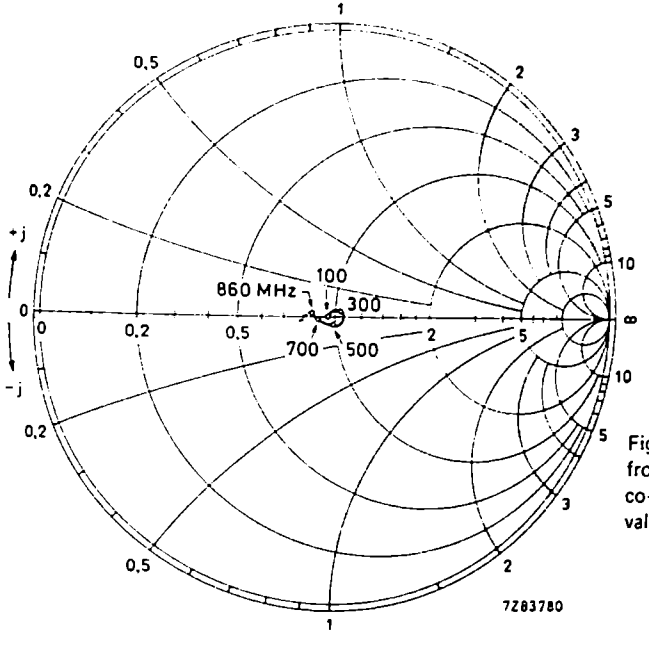


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

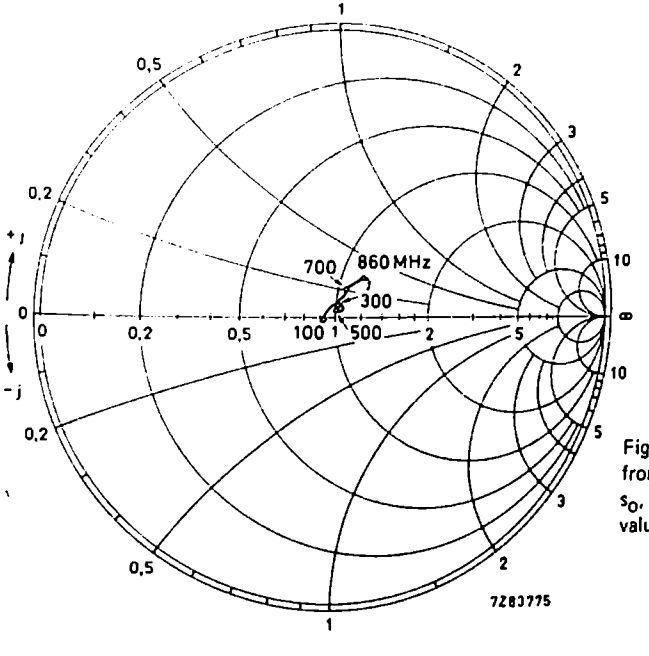


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

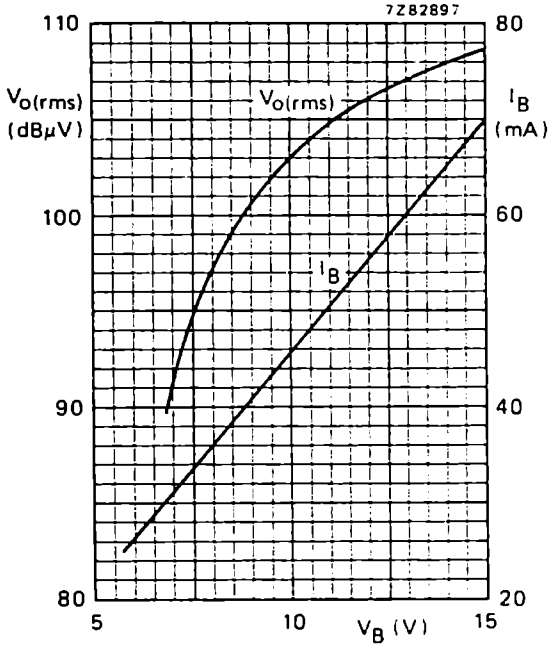


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

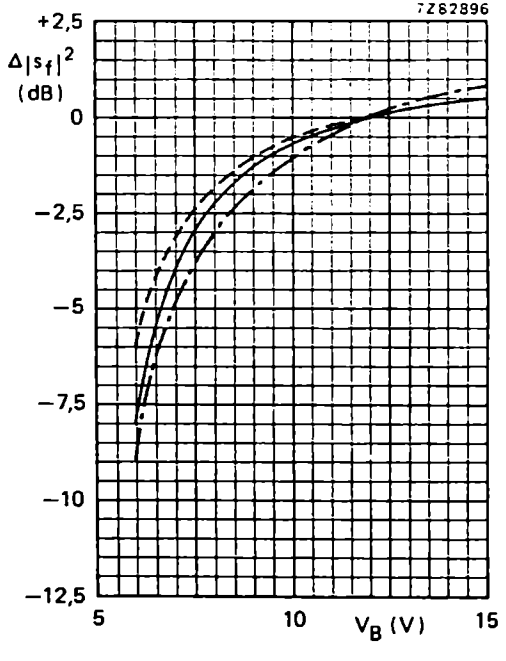


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
–·–·– f = 860 MHz;
typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for use in mast-head booster-amplifiers, as an amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f		40 to 860 MHz
Source and load (characteristic) impedance	$R_s = R_L = Z_o$	=	75 Ω
Transducer gain	$G_{tr} = \|s_{f}\|^2$	typ.	28 dB
Flatness of frequency response	$\pm\Delta\|s_{f}\|^2$	typ.	1 dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105 dBμV
Noise figure	F	typ.	6 dB
D.C. supply voltage	V_B	=	12 V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70 °C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

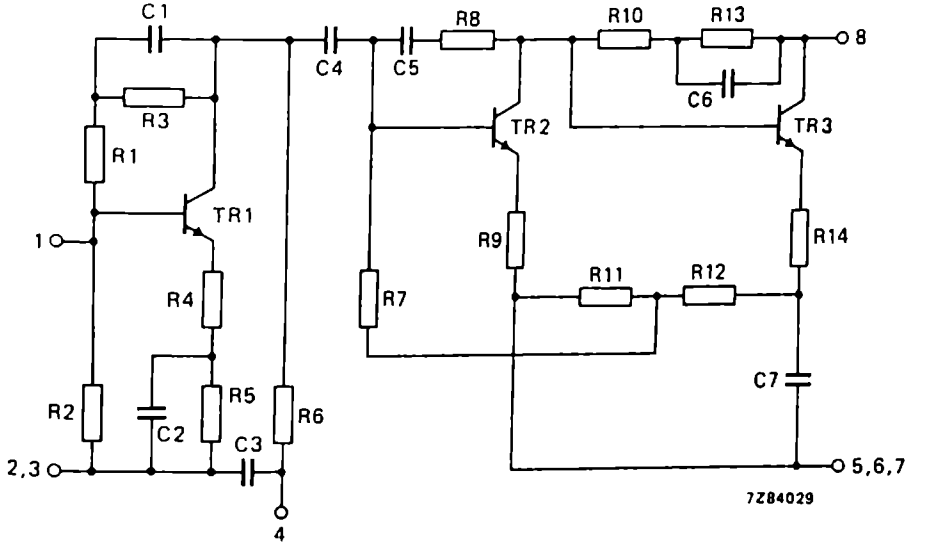


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	−20 to +70	°C
Storage temperature	T_{stg}	−40 to +125	°C
D.C. supply voltage	V_B	max. 15	V
Peak incident powers on pins 1 and 8	P_{I1M}, P_{I8M}	max. 100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	= 25	°C
D.C. supply voltage	V_B	= 12	V
Source impedance and load impedance	R_s, R_l	= 75	Ω
Characteristic impedance of h.f. connections	Z_o	= 75	Ω
Frequency range	f	= 40 to 860	MHz

Performance

Supply current	I_B	typ. 50	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ. 28 26 to 31	dB dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ. 1	dB
Individual maximum v.s.w.r.			
input	$VSWR_{(i)}$	typ. 1,5	*
output	$VSWR_{(o)}$	typ. 1,7	*
Back attenuation			
f = 100 MHz	$\lvert s_r \rvert^2$	typ. 45	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ. 35	dB
Output voltage			
at −60 dB intermodulation distortion (DIN 45004, par. 6.3; 3 tone)	$V_{o(rms)}$	> 105 typ. 107	dBμV dBμV
Noise figure	F	typ. 6	dB

s parameters: $s_f = s_{21}$ $s_r = s_{12}$ $s_i = s_{11}$ $s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to +70 °C
D.C. supply voltage	V_B	=	12 V ± 10%
Frequency range	f		40 to 860 MHz
Source impedance and load impedance	R_s, R_L	=	75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

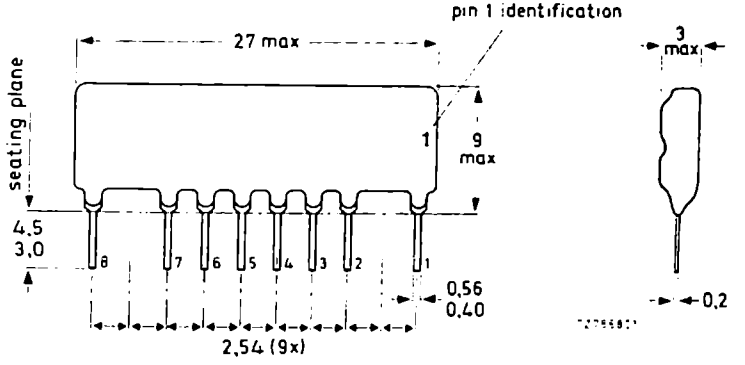


Fig. 2 Encapsulation.

Terminal connections

1	= input
2, 3, 5, 6, 7	= common
4	= supply (+)
8	= output/supply (+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

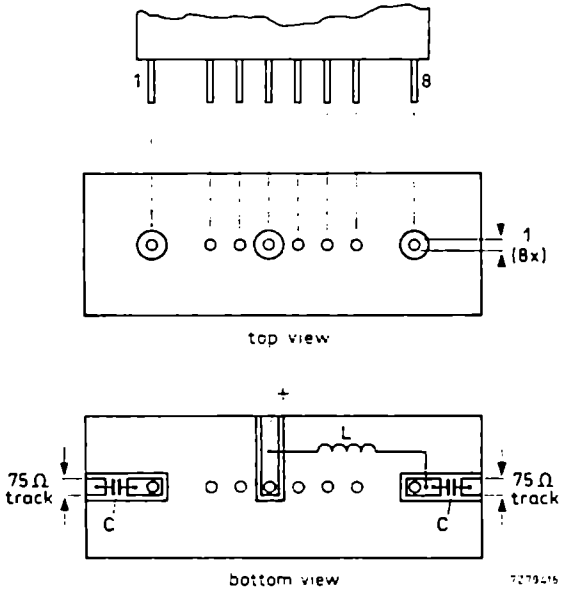
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core (material 4B1; catalogue number 3122 104 91110) with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

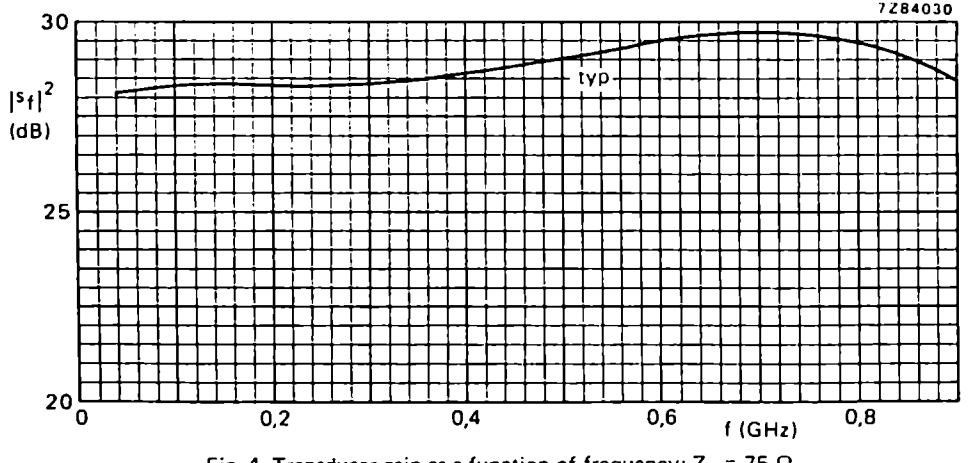


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

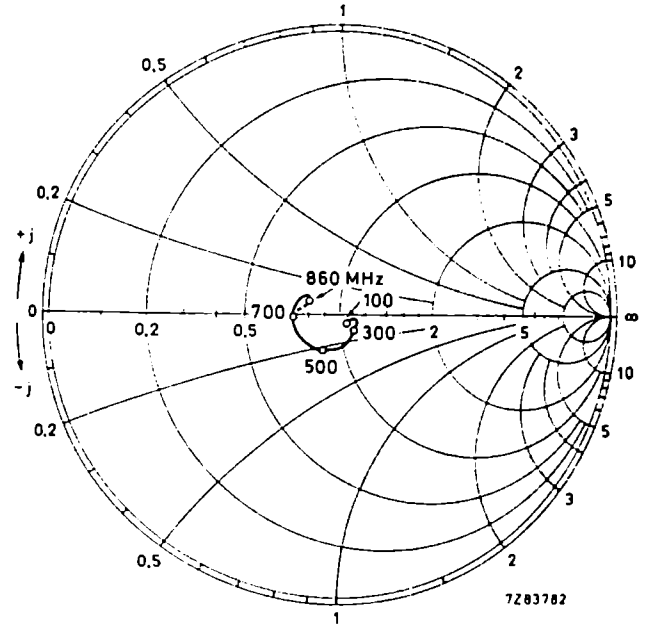


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

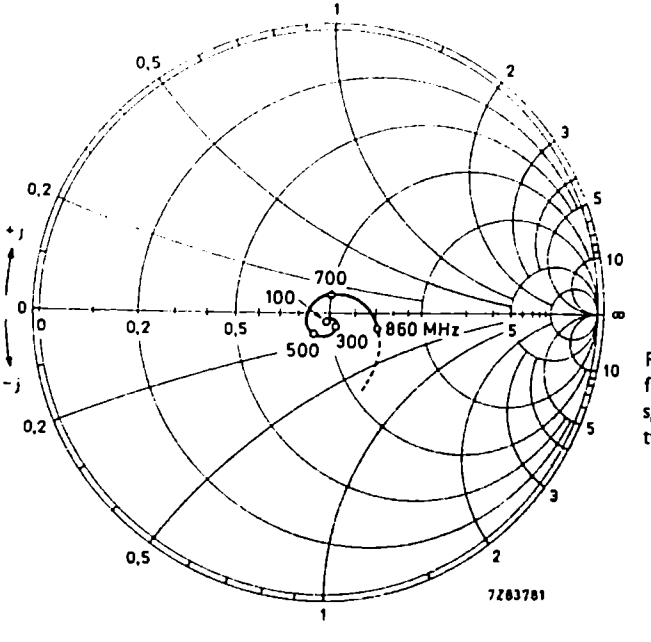


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

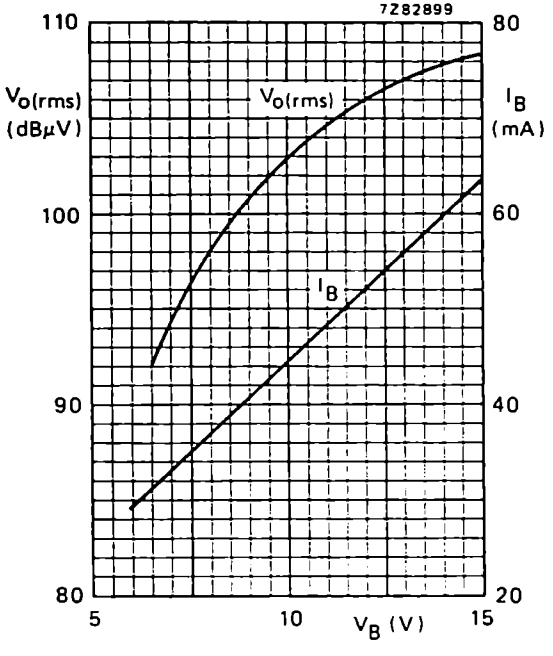


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

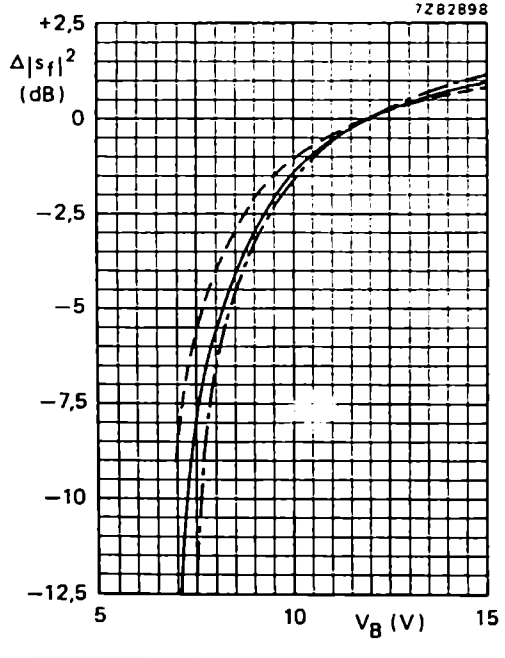


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
–.–.–. f = 860 MHz;
typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for use in mast-head booster-amplifiers, as an amplifier in MATV and CATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_{fl} \rvert^2$	typ.	28	dB
Flatness of frequency response	$\pm\Delta\lvert s_{fl} \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)				
VHF	$V_{o(rms)}$	typ.	113	dBμV
UHF	$V_{o(rms)}$	typ.	112	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 9-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig.2)

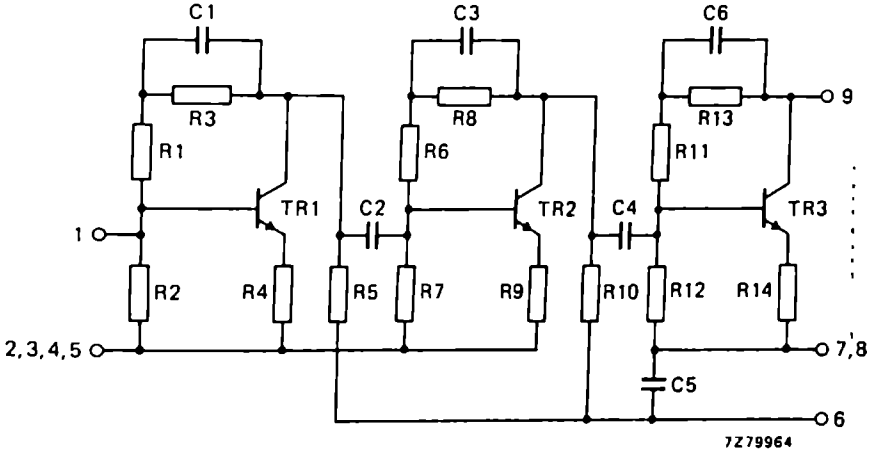


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70 °C
Storage temperature	T_{stg}		−40 to +125 °C
D.C. supply voltage	V_B	max.	15 V
Peak incident powers on pins 1 and 8	P_{I1M}, P_{I8M}	max.	100 mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25 °C
D.C. supply voltage	V_B	=	12 V
Source impedance and load impedance	R_s, R_ℓ	=	75 Ω
Characteristic impedance of h.f. connections	Z_o	=	75 Ω
Frequency range	f	=	40 to 860 MHz

Performance

Supply current	I_B	typ.	105 mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	28 dB 26 to 31 dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1 dB
Individual maximum v.s.w.r.			
input	$VSWR_{(i)}$	typ.	2,3 *
output	$VSWR_{(o)}$	typ.	1,9 *
Back attenuation			
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	45 dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	35 dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6,3; 3-tone)			
VHF	$V_{o(rms)}$	>	111 dBμV
		typ.	113 dBμV
UHF	$V_{o(rms)}$	>	110 dBμV
		typ.	112 dBμV
Noise figure	F	typ.	7 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to +70 °C
D.C. supply voltage	V_B	=	12 V ± 10%
Frequency range	f		40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	=	75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

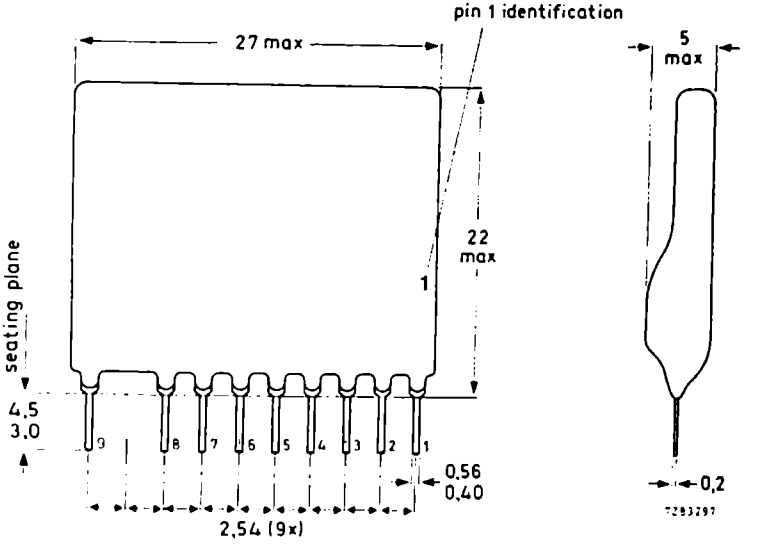


Fig. 2 Encapsulation.

Terminal connections

1	= input
2, 3, 4, 5 and 7, 8	= common
6	= supply (+)
9	= output/supply (+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

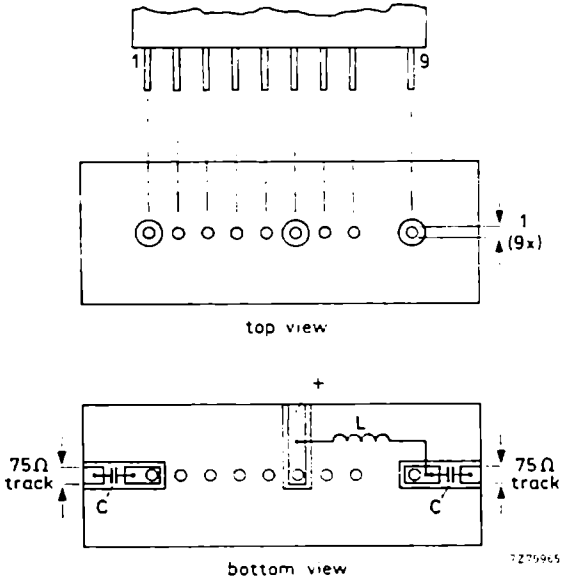
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core (material 4B1; catalogue no. 3122 104 91110) with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

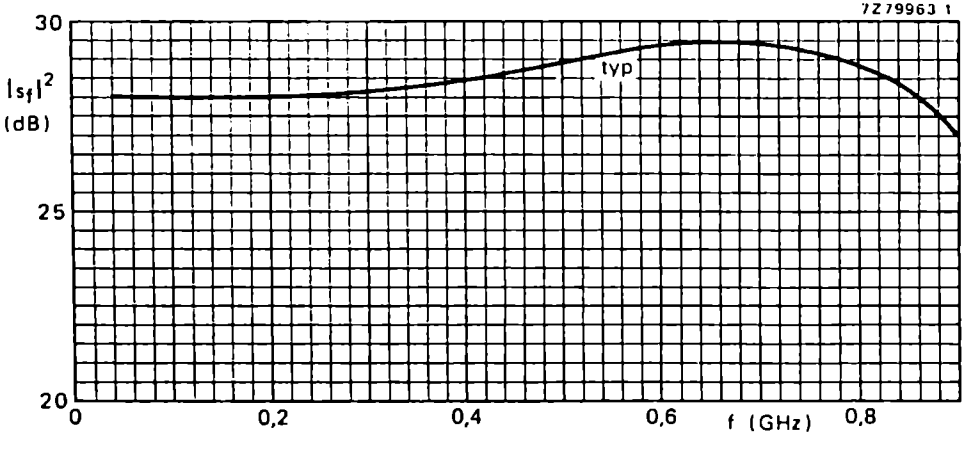


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

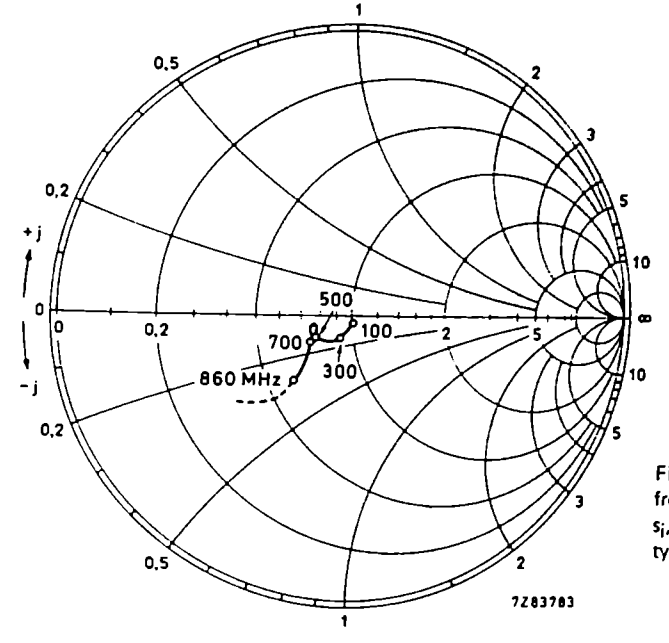


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

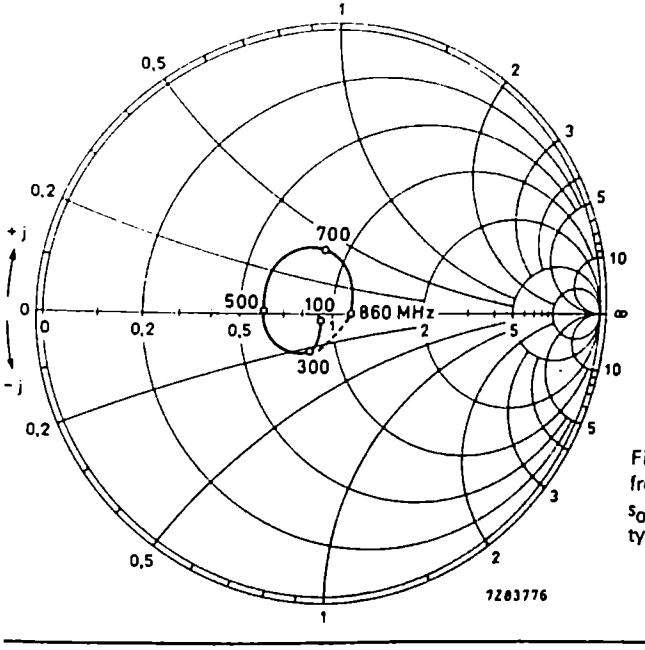


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

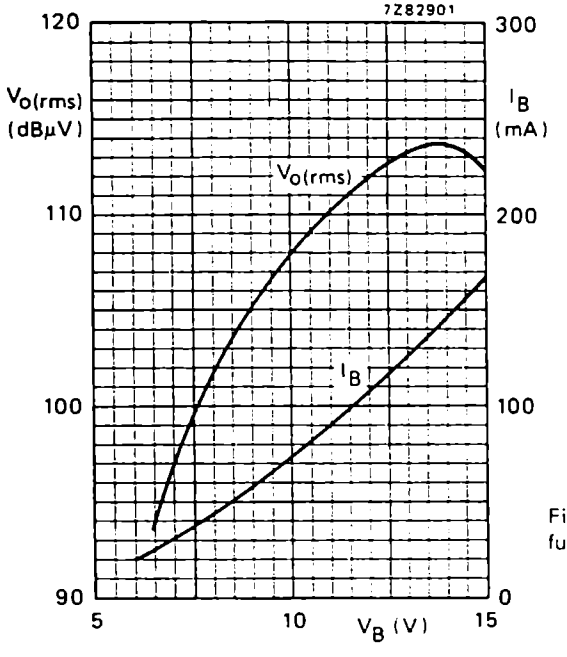


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

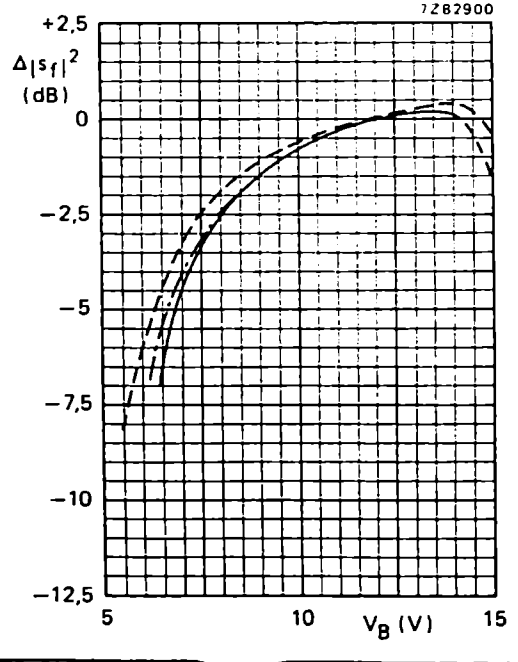


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
–·–·– f = 860 MHz;
typical values.

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